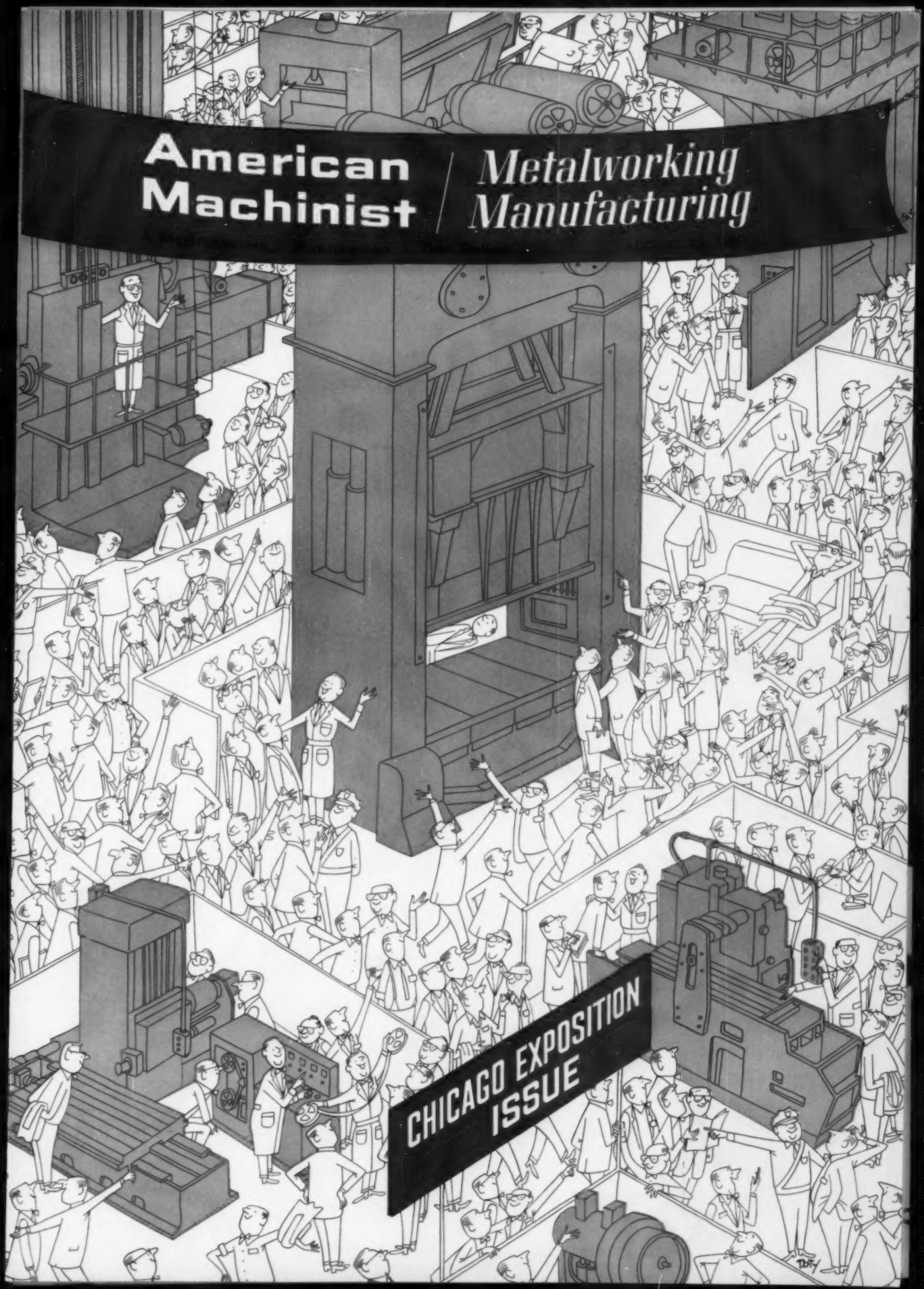

American Machinist
Metalworking Manufacturing
CHICAGO EXPOSITION ISSUE

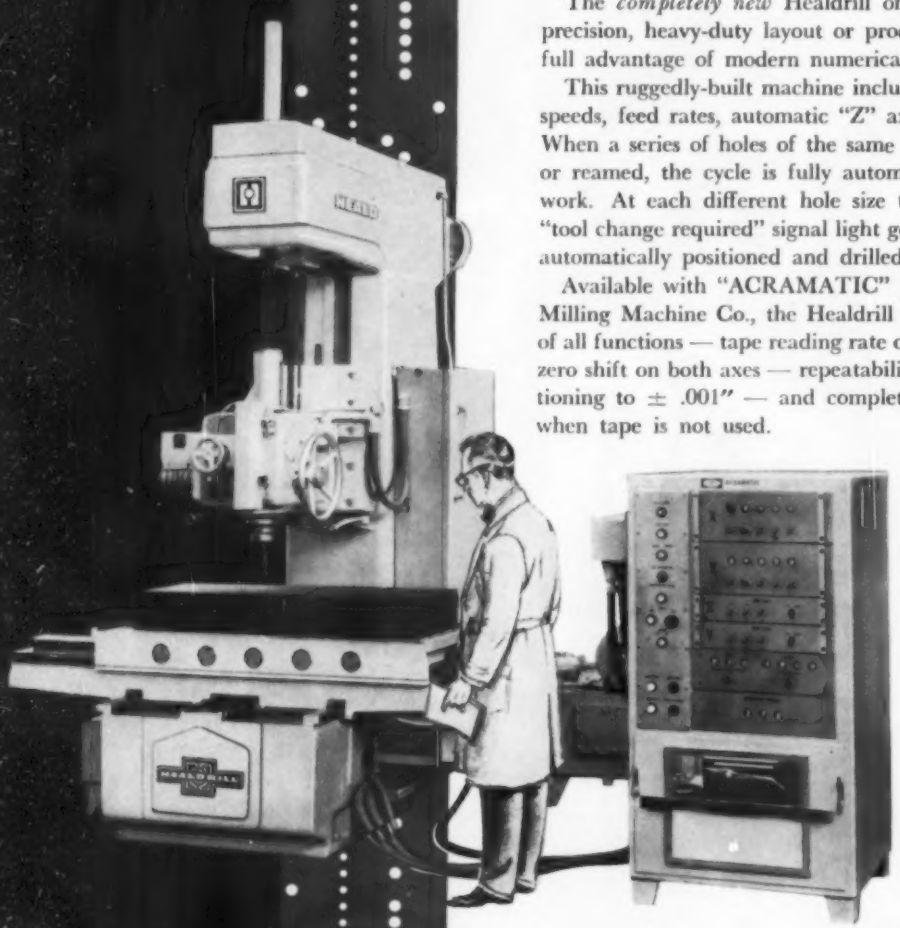
NEW HEALDRILL

... a high-precision drilling machine designed for fully automatic NUMERICAL CONTROL OF ALL FUNCTIONS

The *completely new* Healdrill offers you, for the first time, a high-precision, heavy-duty layout or production drill that's designed to take full advantage of modern numerical control.

This ruggedly-built machine includes tape control of table positioning, speeds, feed rates, automatic "Z" axis cycle and tool-change indication. When a series of holes of the same size are to be drilled, counter-bored or reamed, the cycle is fully automatic, freeing the operator for other work. At each different hole size the cycle stops automatically and a "tool change required" signal light goes on. After change is made, hole is automatically positioned and drilled at correct feed and speed.

Available with "ACRAMATIC" punched tape control by Cincinnati Milling Machine Co., the Healdrill permits simple, direct programming of all functions — tape reading rate of 1200 lines per minute — full range zero shift on both axes — repeatability of ± .0002" — accuracy of positioning to ± .001" — and complete manual control from the console when tape is not used.



SPECIFICATIONS

Table Size	24" x 56"
Longitudinal Table Travel	48"
Transverse Table Travel	20"
Vertical Range	0-30"
Spindle Speed Range	30-1800 rpm in 16 steps
Feed Range	.002"-.030" per rev. in 8 steps

SHOWN IN ACTION in Booth 924 at The Machine Tool Exposition. Write to Heald for additional information.

it PAYS to come to Heald

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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MMT-PE

CIRCLE 701 READER SERVICE CARD

COVER:
A lighthearted view of the Chicago shows by Roy Doty, based on an idea by Joe Poznanski

American Machinist / Metalworking Manufacturing

contents for August 22, 1960

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METALWORKING REPORT

Chicago Exposition Edition

NUMERICAL CONTROL

Breakthrough

An unparalleled opportunity to see numerical control in action will be provided at the Machine Tool Exposition and the Production Engineering Show in Chicago. At press time, a total of 85 machines are scheduled, 69 at the Amphitheatre and 16 at the Navy Pier.

Charts giving details on these 85 machines and telling where to find them at the shows will be found on page 191 of this issue.

Positioning systems will dominate, with a total of 57 at the Machine Tool Exposition and 14 on the Navy Pier. Several of these have controls that provide for cutting slopes and simple contours.

There will be 12 contouring systems at the Amphitheatre and two at the Production Engineering Show on the Navy Pier.

No machine tool with numerical control has been reported for the Coliseum Machinery Show at press time.

The largest single display will be by Burg Tool with seven machines in a single booth at the Amphitheatre. There will also be two Burgmasters in the Bendix and Moog booths on the Navy Pier.

Cincinnati Milling will have nine machines at the Amphitheatre, three in the Cincinnati Milling booth, four in the Cincinnati Lathe booth, and two in the Heald booth. There will be one Cincinnati milling machine on the Navy Pier in the Wang booth.

Other large displays of numerical equipment will be by Giddings and Lewis with six machines and Fosdick with five.

The guide to numerical control on page 191 shows locations in this issue of more details on many of these machines.

A total of 24 builders of control systems for numerical control are represented in the Chicago shows. General Electric dominates with 26. Cincinnati Milling has 9, Giddings & Lewis 6, Bendix and Norden have 5 each.

Bendix and General Electric are introducing contouring systems with simplified programming. Most of the systems are looking toward either simplifying the system itself or reducing the time and cost that must be spent on programming.

An extremely simple system is the one operating on variable voltage set by dial control being shown by Seneca Falls. Dial or key setting, rather than tape, is also possible on some machines with Carlton, Fosdick, General Electric, and Giddings & Lewis controls.

New approaches include two grinding machines that will have full contouring systems. These are being shown by Thompson Grinder, with a Thompson-Ramo-Wooldridge control; and Cincinnati Milling, with an Acrosonic control. To these can be added the previously announced Ex-Cell-O machine which has a cam-grinding head, with a Bendix contour control.

American Tool Works is taking an interesting approach with a positioning control on a lathe combined with a full hydraulic tracer control for contouring work. The tracer system will be controlled by the machine's positioning control system.

CONTROLS

An electrical programmer available with several Pope boring machines is about a half step between conventional control and numerical control. Practically all possible machine controls are located in a remote console, and there are no manual handwheels at the machine itself. The console has dials and switches for spindle speed, feed motion, timing, and head synchronization when there are two or more heads in the boring machine. Unlike N/C, it has no feedback control; however, machine operation should be much surer and faster than with conventional controls, p216.

Another programming device—this one for an Elmes/King boring mill—puts the machine through a fully automatic cycle. The control is called Ultramatic, and it provides sequence of movement for each head on a 46-in. vertical boring and turning machine. Setup is made with jumper cords on individual "patchboards." These are then placed in a control console where they are hooked into the electrical circuit to operate the machine, p 217.

CUTTING

Reportedly the largest of its type on the market, a new Barber-Colman lathe, Model 1610, is for high-speed turning, facing, and boring. It has three ranges of spindle speeds with maximums at 1500, 2000, or 2500 rpm. Feeds vary infinitely from 0.0001 to 0.488 ipr. If desired, a hydraulic tracing attachment can be included, p209.

Among a large number of non-N/C machines, a Monarch 30-hp tracer lathe has an optional speed range with a top speed of 2670 rpm; high for a large lathe. The tracer attachment works with only 5-6 oz of pressure against the templet, and the machine is claimed to reproduce the templet shape within an accuracy of 0.001 in. The tracer is air-operated; the machine has hydraulic power, p208.

Milling machine for $1000 is still possible. U S Burke has a vertical toolroom milling machine with table and ram and quill motions for under $1000. The miller has six speeds from a ¾-hp motor.

Two constant-power lathes at the show are designed for much different purposes. One is a Bardons &

Oliver ram-type turret lathe with quick speed and feed control. The other is a small Nebel with modernized head housing and high spindle speeds, p202 and 209.

Low cost is the claim, along with higher speed and greater accuracy, for Van Norman ram-type milling machines based on the company's 16 series. Two of the machines are to be shown, one a medium-weight unit for horizontal, angular, and vertical cutting; and the other a quill-cutterhead model for drilling, boring, and reaming in addition to milling, p242.

Shapers are still basic — and the field is still active. Smith & Mills division of Nebel has a shaper contouring accessory that operates automatically with a stylus and electronic controls. Accuracy is said to be just as good as the basic machine, p290.

Drilling and tapping from the same multi-spindle head is a feature of Natco's FB line. Transfer from drilling to tapping, and tap-spindle reverse, are managed by electric clutches under switch control, p233.

Twin-ram broaching can now be done on pulldown operations, according to Colonial Broach. The principle has been applied to surface broaching in the past. The system works as two rams travel in continuously opposed directions. The work is cut rapidly, and the operator can load one fixture while the other is in the machine, working. Colonial has a 6-ton machine with 42-in. stroke for demonstration, p237.

A single "joystick" control runs the Landis Machine Landmaco, a new thread-cutting machine. One stick position opens the grips (the hydraulically operated carriage fronts), a second closes them, and a third position initiates the threading cycle. The only manual operation required is to insert a new blank at the start of the cycle, then remove it when the job is finished, p234.

THE OUTLOOK

In the next 18 months metalworking will spend $1.5 billion on new machine tools, more than it has in any like period in several years—an indication that the industry is readying for vastly expanding metalworking markets in the decade ahead. (See p149).

GRINDING & FINISHING

Fast wheel speeds up to 8500 sfpm for cylindrical grinders will be featured in new Norton machines. This is a hike from 6500 sfpm, which has been normal in the past. The higher speeds imply grinding-time reductions of 30%, which are possible because of machine-design improvements and better grinding wheels, p252.

A pendant controls the wheelhead on the Thompson CX Plunge-Matic grinder, replacing the usual handwheel for wheelhead elevation. This feature, on both automatic and manual machines, is controlled by dials on the pendant control panel. For example, automatic downfeed from 0.0002 to 0.006 in., in increments of 0.0002 in., can be set into the machine by turning one dial, p 271.

A double-end grinder, with one wheel for tool grinding, and the other a cup wheel for production work, is being demonstrated by Hammond at the PE Show. The same machine can be equipped for electrolytic grinding with an Anocut power package installed either inside the machine or in an external cabinet, p524.

High-production finishing of small parts is possible with "microstoning" techniques that have been built into two Taft-Peirce machines. These units microstone parts by turning them between two rotating rolls, where they are kept in contact with a rapidly oscillating abrasive stone. Claimed to be the first of their kind built in this country, the units incorporate the principles of Taft-Peirce's Supfina Microstoning attachments, introduced in 1959, p262.

TOOLS

New ultrasonic techniques, and accessories and tools for ultrasonic equipment, will be in evidence at the Sheffield booth. Segmented tooling is one idea, based on the building-block concept, that arranges the tools for multiple as well as single-station machining at one transducer. New information about ultrasonics allows using a single toolholder, but mounting several different tools of several sizes in succession, to cut different work with maximum efficiency. Another device grinds the face of an ultrasonic tool after it has worn, without it being necessary to remove the toolholder from the transducer, p247.

Carbide puttin'-on tool, made by Easco, deposits carbide on worn tools for extended wear from 50 to 400%. It is a variation on electrical discharge, but puts on instead of takes off. Applications are on cutting tools, punches, and dies; all HSS.

A precision bench gage by Sunnen is equipped with dial-in measurement that provides a master or gage-checking dimension from 0.375 to 2.900 in. It is a mechanical unit claimed to provide accuracy only obtainable previously from air or electrical mechanisms.

An inexpensive balancer — around $3000—is being shown at the PE show by Stewart-Warner. The machine handles such parts as motors in medium sizes, and has capacities of 500 lb, 55 in. between centers, and 44 in. on the diameter, p522.

Attachments for screw machines to be demonstrated by Brown & Sharpe include a broaching rig that can cut both the front and back of a workpiece. A fourth slide is available for forming and cutoff work, while the rear cross-slide is left

COMING IN AM/MM—SEPTEMBER 19

On-the-Spot Report from Chicago on the Three Shows:

Machine-Tool Show; Production Engineering Show; Machinery Show

The latest on new production techniques and equipment, plus descriptions of last-minute developments.

open for back attachments. Automatic gaging is available to check work size as operations are completed. This shuts down the machine if parts are out of tolerance, and it makes unnecessary later gaging. A broken-drill detector shuts down the machine before follow-up tooling can be damaged.

FORMING

A refinement in shear fixturing is Lodge & Shipley's "Sof-Loc" air-hydraulic holddown system that features light weight impact on the work when the clamps come down. The result is less vibration and noise, and less shock and damage to the work, p275.

First double-crank dieing machine built by HPM, a Henry & Wright 75-ton machine, will be displayed with roll feed, scrap cutter, motor-driven cross adjustment, and thermoswitches in the main bearings. The unit has speeds from 70 to 210 strokes/minute, p 282F.

Double-part bending is the advantage of a Pines rotary bending press that will form two 1-in. steel pipes (16-gage wall) at once. The 5-T press will also take single pieces of 1¼-in. tube.

WORK HANDLING

Stock handling is easier at Marvel saws because of a power-packaged live-roller table, built in 12-ft increments. It operates at any speed up to 70 fpm in either direction, all under single-lever control. The table is rated at 7500 lb, and may be fastened to the saw or mounted in line, some distance away, p274.

Miller parts handler that can be attached to any machine is capable of moving small parts past the cutter at speeds up to 6000/hr. A chain drive moves two jaws that open and close automatically. Parts feed from a hopper or can be hand fed. The AutomaticMill attachment is made by Baird, p239.

Mechanized assembly is easier with a six-station rotary indexing machine to which positioning and sliding mechanisms have been attached. The Ferguson machine is a standard unit to which only work-holding fixtures must be added — and these are left off the basic machine because they will vary in shape according to the assembly being processed.

MACHINE DESIGN

Quiet gearshifting is a feature of American's Pre-Select lathe. Hydraulic gearshifting is silent because the gears oscillate during the shift—and this motion prevents clash. The company says this is not just a wild claim—there is absolutely no noise at all, p211.

Less heat buildup in the bed is the result when Landis Tool designs out all open hydraulic drains in a plain grinder. The hydraulic reservoir and motor have been taken out of the machine and located independently. This keeps heat from the oil and chips away from the machine head to improve accuracy, p264.

Similar "dry - base" design by Blanchard keeps coolant and chips away from the machine beds. This also makes coolant filtering easier.

Constant feed rate, in any longitudinal or cross direction, is featured in Lodge & Shipley lathes that have a modulated-feed tracer control. The idea is to produce constant feed rate no matter which direction the contour takes, thus keeping chip size constant.

Building-block design for a Sundstrand-American three-way vertical broach provides interchangeability for components and allows the machine to be converted quickly (and cheaply) from surface broaching to pull or push broaching. The machine has a column, slide, table, hydraulic unit, coolant control, and retriever units all to standard design, p238.

No gear and cone unlocking is possible with a Sidney-redesigned gearbox equipped with a dual-cam tumbler lock. This keeps the gear and cone-gear locked, even during heavy cuts—a point brought out by a survey of suggestions by prospective customers, p210.

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CIRCLE 704 READER SERVICE CARD ►

Robert C. Bevis, Sales Manager Machine Tool Division, The Cincinnati Milling Machine Co., comments on the significance of machine tool expositions and the accelerated pace of developments.

MACHINE TOOL EXPOSITION · 1960

New Ideas and New Opportunities to Reduce Costs

Machine Tool Expositions serve a unique purpose. They are designed to demonstrate lower cost manufacturing methods and machines and promote their acceptance. Only through adoption and application of new equipment and production ideas can we advance as individuals, as companies and as a nation. In his address during our 75th Anniversary event, Frederick V. Geier, Chairman of our Board, concisely wrapped up the entire machine tool exposition concept when he said:

"Better machine tools are the cutting edge to economic progress."

Much has been accomplished since the exposition in 1955. We at Cincinnati Milling have been working hard to bring you new ideas, new methods, new machines to help fulfill your own responsibilities of creating and producing greater values in your products.

Elektrojet Electrical Discharge Machines, for example, have been greatly improved and expanded to 32 sizes and styles, some large enough for crankshaft dies. Electrolytic Grinding and Electro-Chemical Machines have greatly extended the opportunities in electrical machining.

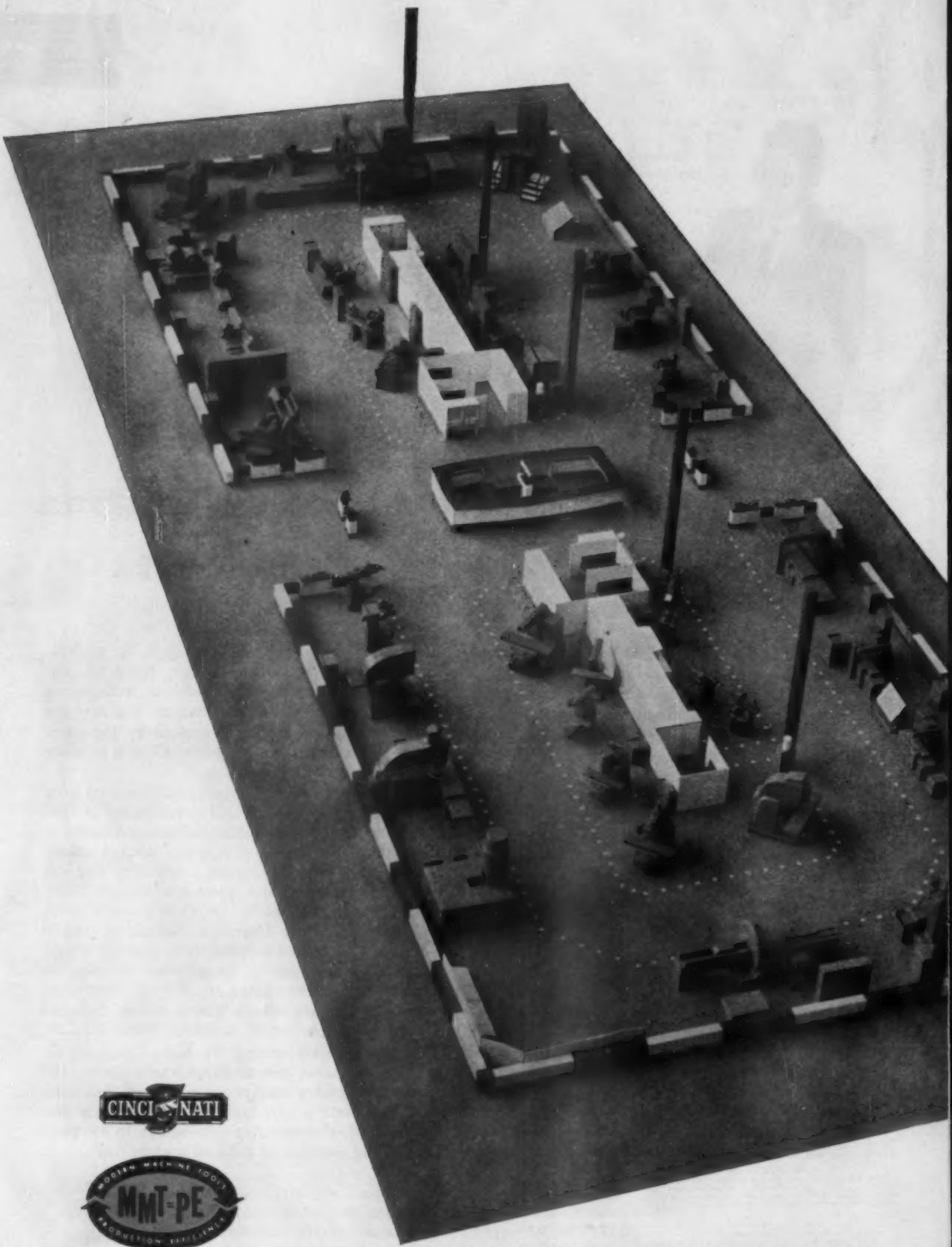
In the field of milling, many improvements, innovations and new machines will be evident. CINCINNATI VerciPower, a new, powerful, rigidly built all-purpose milling machine, introduces a new image of rapid metal removal. The new age of precision will be demonstrated by the latest centertype, centerless and Micro-Centric grinding machines and gaging devices.

Machine tool control equipment has long been the subject of research and development at Cincinnati Milling. Acramatic Numerical Control is one development. It offers many distinct advantages for contour milling and positioning. You will also find it applied in a brand-new manner, which we will call "machine X" until you actually see it. Other displays are Telematic Control for plug-in selection of cycles; matched-hole grinding equipment; Acrasize gaging. In addition to being incorporated in machines on exhibit, Cincinnati machine tool control equipment will be displayed as a separate center of attraction in exhibit 928.

And in metal forming, the Meta-Dynamics Division will show new techniques that have moved from conjecture into practice. A new Intraform machine and a new high speed Hydroform machine will offer amazing possibilities in increased operating speeds and reduced tooling costs.

For your convenience, our parent Company, its Divisions and two of its associate Companies are grouped in areas Nos. 1034, 1027, 934, 928 and 924. Stop in and discuss your metalworking problems. We have a convenient information center in our main display area 1034 illustrated on the following pages. We'll be glad to see you. And we know we can help you reduce your costs!

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio



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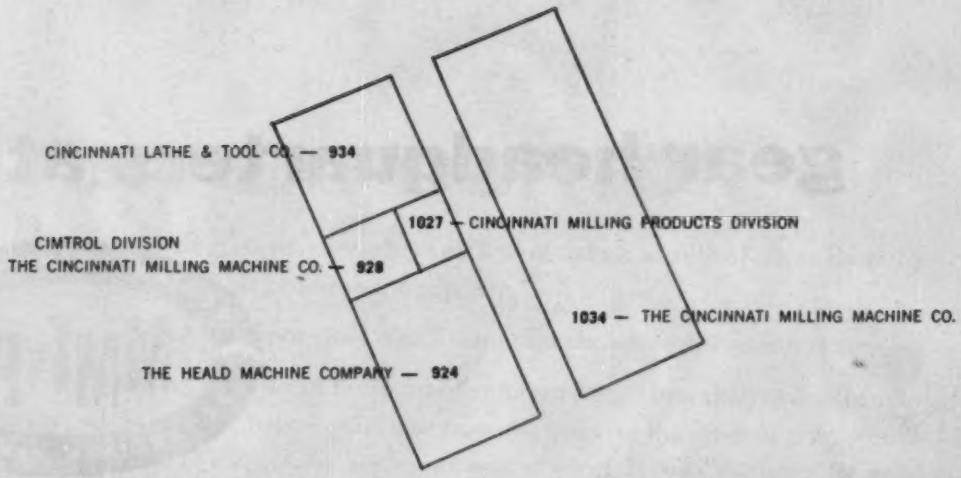
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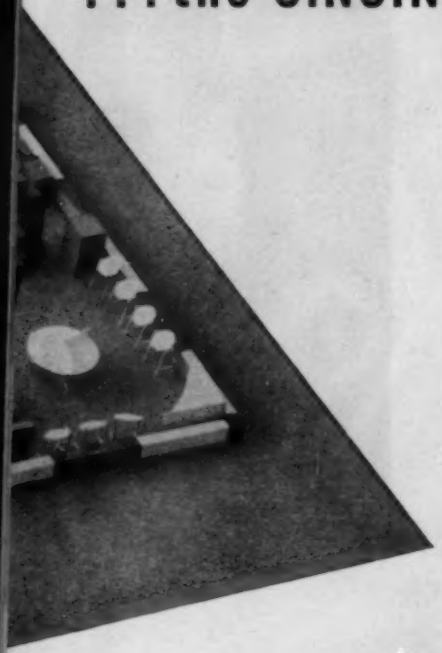

"Addresses" worth remembering: 1034, 1027, 934, 928, 924. They're the Machine Tool Exposition "addresses" of The Cincinnati Milling Machine Co., its Divisions and associate Companies. In these contiguous display areas you will see the finest array of machine tools and complementary equipment ever assembled for public inspection. In area 1034 you will find equipment for many types of advanced metalworking manufacturing:

• Production and Toolroom Milling • Numerically Controlled Machines • Die Sinking • Cutter Grinding • Surface Broaching • Centertype and Centerless Grinding, including Super Precision • Micro-Centric Grinding • Electrical Machining • Metal Forming • Automatic Control and Gaging Equipment • Special and Automated Machines

There are 35 Cincinnati machines of the foregoing types, all operating, all offering new ideas and new opportunities to reduce costs. And right across the aisle is another area of almost equal size, containing operating exhibits of two Cincinnati Milling Divisions and two associate Companies. These Cincinnati exhibits reveal the finest in metalworking progress. Be sure to reserve plenty of time for a thorough inspection of all of them.

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No. 4BGS Fellows Gear Finisher

NMTBA EXPOSITION

If you use gears (and who doesn't?) you'll want to look in at the Fellows booth to see the latest in gear production equipment.

If you produce your own gears, you'll want to make booth 929 your first stop.

Here you'll see an array of manual and automated machines designed to handle almost any spur or helical job, right from the blank to the finished gear. You'll see the famous Fellows Gear Shaper, as well as other Fellows machines for hobbing, finishing, grinding and inspecting, and a machine for sharpening helical gear shaper cutters.

Remember the booth number: 929. Trained Fellows specialists will be on hand to explain the machines and to answer any questions you may have.

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THIS THREAD ROLLING OPERATION

will come to life at MMT-PE *booth* 432

The Thread Rolling operation illustrated here, and a series of other threading operations, will be demonstrated by the Landis Machine Company in Booth 432 at the Machine Tool Exposition. At the booth you will get a close first-hand look at how Thread Rolling has proved to be beneficial in many ways to a growing number of users.

You will see demonstrated on the LANHYROL and LAN-NU-ROL Thread Rolling Machines: ❶ Infeed Rolling that reduced overall cost by 80%; ❷ Continuous Knurling and Rolling in one spindle revolution; ❸ Reciprocal Rolling of large diameters; ❹ Automatic Infeed Rolling of involute splines; ❺ Roll-straightening of double-end studs; ❻ Continuous Rolling of extra long threads; ❼ Automatic Thrufeed Rolling; ❽ High Production Infeed Rolling; ❾ Infeed Rolling of large diameter double-end studs; ❿ Automated Infeed Rolling.

TAPPING and CUTTING operations will also be demonstrated on the Coupling Tapping Machine, the 4-Spindle Semi-Automatic, and various models of the LANDMACO Threading Machine. These include: (1) Automatically tapping threads in external upset tubing couplings; (2) Cutting threads on insulator pins at a high production rate; (3) Cutting large diameter threads; (4) Cutting threads on close nipples automatically; (5) Cutting threads with an automated LANDMACO Threading Machine.

In addition, the complete line of Die Heads, Taps, Thread Rolling Attachments and Thread Rolling Heads will be displayed. Experienced LANDIS engineers will be available to discuss any problem dealing with method, equipment, or thread design.

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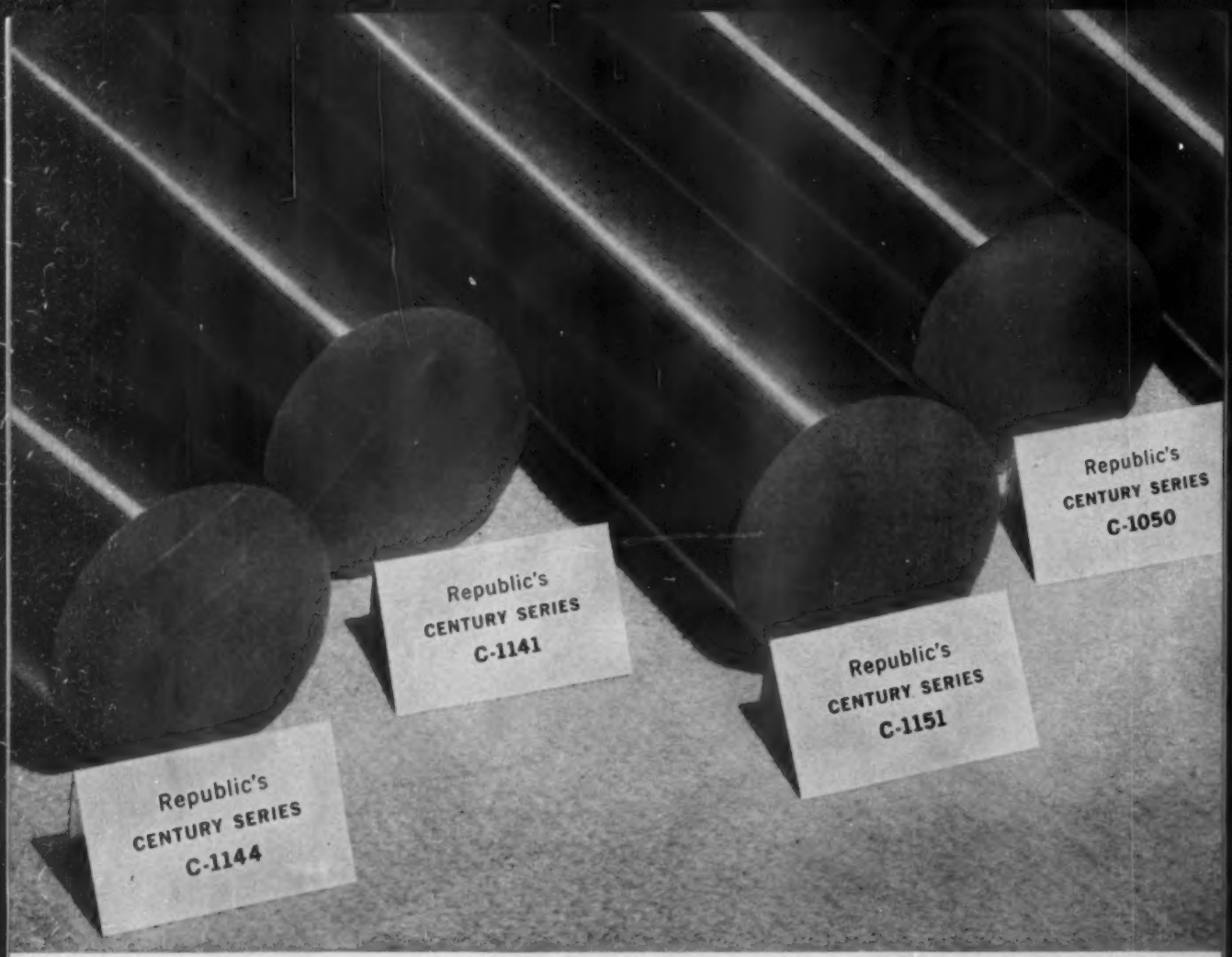
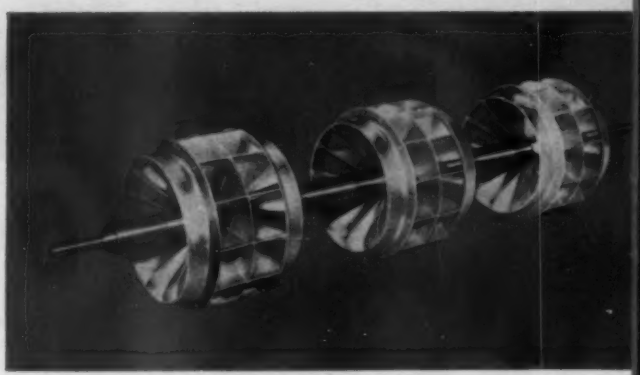
ABRASIVE SURFACE GRINDERS
Booth No. 825

MACHINE TOOL EXPOSITION

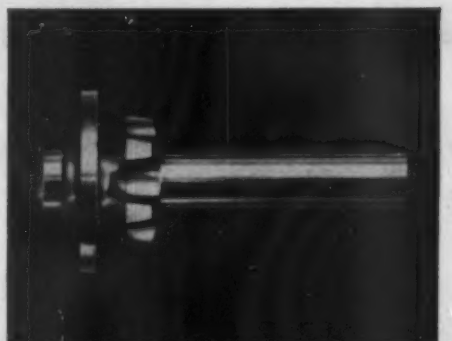
LANDIS TOOL COMPANY, WAYNESBORO, PENNSYLVANIA
GARDNER MACHINE COMPANY, BELOIT, WISCONSIN



ROTOR SHAFTS UP TO 94" LONG: Buffalo Forge Company has eliminated machining entirely by utilizing Republic ELECTRUNITE® Mechanical Tubing. Designed to turn at 1,110 rpm, these rotor shafts require exact balance to maintain high operating efficiency. Close-tolerance concentricity of ELECTRUNITE is vital. Republic ELECTRUNITE Mechancial Tubing is available in carbon and stainless steel. Mail coupon for details.



AUTOMOBILE STARTER DRIVE PINIONS: Eclipse Machine Division, Bendix Aviation Corporation, uses Republic Type 8617 Cold Drawn Alloy Steel. In addition to greater strength and dependability, this alloy gives Eclipse better machinability at reasonable cost. Alloy bars are blanked, hobbed, chamfered, and drilled. Teeth are cut on a gear hobber, then pointed for easy meshing with the flywheel. Send for details on Republic Alloy Steel.



ONE-PIECE VALVE STEMS: National Acme Company uses Republic ENDURO® Type 303 Cold Finished Stainless Steel for Hyseal Valve Stems used in new American-Standard single-lever mixing faucets. These valve stems are completed in a single setup. Ten operations including a multiple end drilling of six holes on a 15° angle are performed in 12 seconds. For information on the more than 40 standard types of stainless steel available from Republic, mail the coupon.

CIRCLE 713 READER SERVICE CARD

Republic's

CENTURY SERIES...

MINIMUM YIELD STRENGTH 100,000 PSI

...5 grades, 5 degrees of machinability, 5 price levels!

To save time and money in steel parts production, choose from this family of five grades of high strength, stress-relieved, cold finished steel bars.

Republic's CENTURY SERIES provides varying degrees of machinability. Yet, each grade—C-1045, C-1050, C-1151, C-1141, and C-1144—offers minimum yield strength of 100,000 psi. Better strength/toughness ratios are frequently obtained by selecting one of the lower sulphur, *less expensive* grades. Return the coupon for your free copy of Republic's CENTURY SERIES Booklet.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

CIRCLE 714 READER SERVICE CARD

REPUBLIC STEEL CORPORATION
DEPT. AM-9663-A
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on:

☐ CENTURY SERIES ☐ Cold Finished Stainless Steel
☐ ELECTRUNITE Mechanical Tubing
☐ Republic Alloy Steel

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

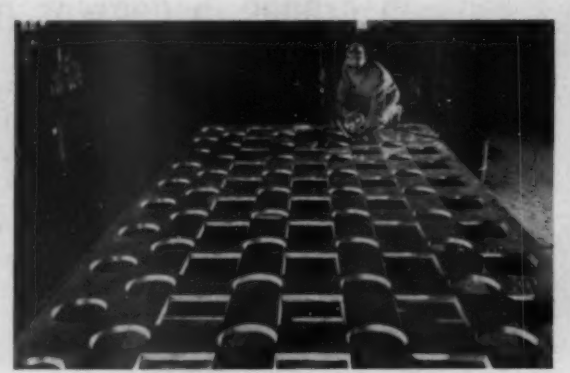
Eye Accidents Cut 92%, Compensation Ins. Costs Cut 51% at CPC Engineering with AO Protection Program

CPC ENGINEERING CORP., Sturbridge, Mass., fabricators of steel, aluminum, stainless steel components and pressure vessels, is another company that KNOWS eye protection pays off. Before installing an AO prevention program, eye injuries in this young, growth company were 120 per year and workmen's compensation insurance premiums $12,000. Currently eye injuries are ten per year and premiums are $5,800. The hours saved by the program are an additional advantage.

Another user of AO eye protection equipment, one of America's largest companies (a company that has prevented 51,000 eye accidents and saved $453,000 in 13 years) puts it this way: "The potential loss of an eye from the hazards of a work operation is the basic justification of an eye protection program. The additional potential dollar savings in medical and compensation costs and time per employee protected per year indicate that the program is self-supporting."*

*Records indicate an AO eye protection program can pay for itself in less than 6 months. Write for new booklet, "Eyes Are Expensive Targets".

Always insist on ® Trademarked Safety Products.



Worker sawing aluminum base plate for nuclear fuel storage rack.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
Southbridge, Massachusetts

Safety Service Centers in Principal Cities

Your Surest Protection . . . AO SURE-GUARD Products

see these
Landis Abrasive Surface Grinders
at the
Machine Tool Exposition

new designs
new features
new methods

BOOTH 825

Landis Tool Company, Waynesboro, Penna.

LANDIS

ABRASIVE

precision surface grinders

NORTON

Visit us at the
NMTBA Show
Booth No. 651
International Amphitheatre, Chicago
Sept. 6-16, 1960
See the Norton Man about
your grinding problems — wheel or machine

Don't handicap any new grinder . . .

give it the Norton wheel it needs!

Scores of new grinding machines will be on display at Chicago — cylindrical and centerless grinders, surface grinders large and small, internal grinders, tool grinders of all kinds, thread grinders, disc grinders, universals. Whichever you buy keep in mind that:

FIRST: No grinding machine can be better than its grinding wheel.

All the design talent and skill that goes into producing any grinding machine . . . including ours . . . is brought to a focus on one relatively small element — the contact area between grinding wheel and workpiece. Naturally, if the wheel that makes this contact is a below-par performer, so is the entire machine.

SECOND: No grinding wheel can be better than a Norton wheel.

This second fact is just as solid as the first. For Norton has put more time and effort into the pioneering and development of abrasive products than has any other organization. The result is unquestioned in the abrasive field. Norton wheels have been giving on-the-job proof of top performance for 75 years. And today Norton continues leadership in the following:

Product Variety. The Norton line is the world's most complete, with exactly the right wheel for every grinding job you do. Included are diamond wheels, using mined or man-made diamonds . . . plus newest developments in bonds and abrasives . . . every wheel type and size you can name.

Application Assistance. Quickly available from your Distributor's Norton-trained specialist or your Norton Man. Your grinding jobs will be studied and the most effective wheel for each one will be recommended by an expert abrasive engineer.

Local Stocks. Your Norton Distributor keeps his stocks ample to meet his area's needs — yours included . . . and in five strategic centers there are Norton warehouses with thousands upon thousands of wheels. The wheels your grinders need for best performance — and *you* need for lowest grinding costs are handy to you. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

NORTON
ABRASIVES

W-1989

75 years of . . . Making better products . . . to make your products better

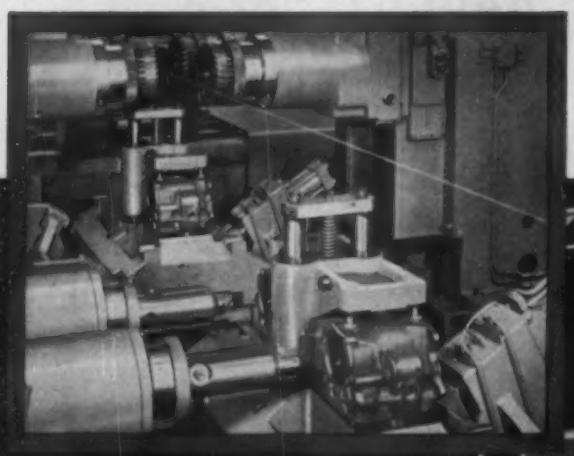
NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

CIRCLE 718 READER SERVICE CARD ▲

CIRCLE 719 READER SERVICE CARD ►

Cross Introduces Automation for High Precision Boring and Facing

Many Unusual Features in New Transfer-matic for Machining Transmission Cases



Finish boring the front and rear main bores with one bar to assure concentricity.

Operations include boring the main shaft, counter shaft, reverse idler, and two shifter rod bores and precision facing both ends.

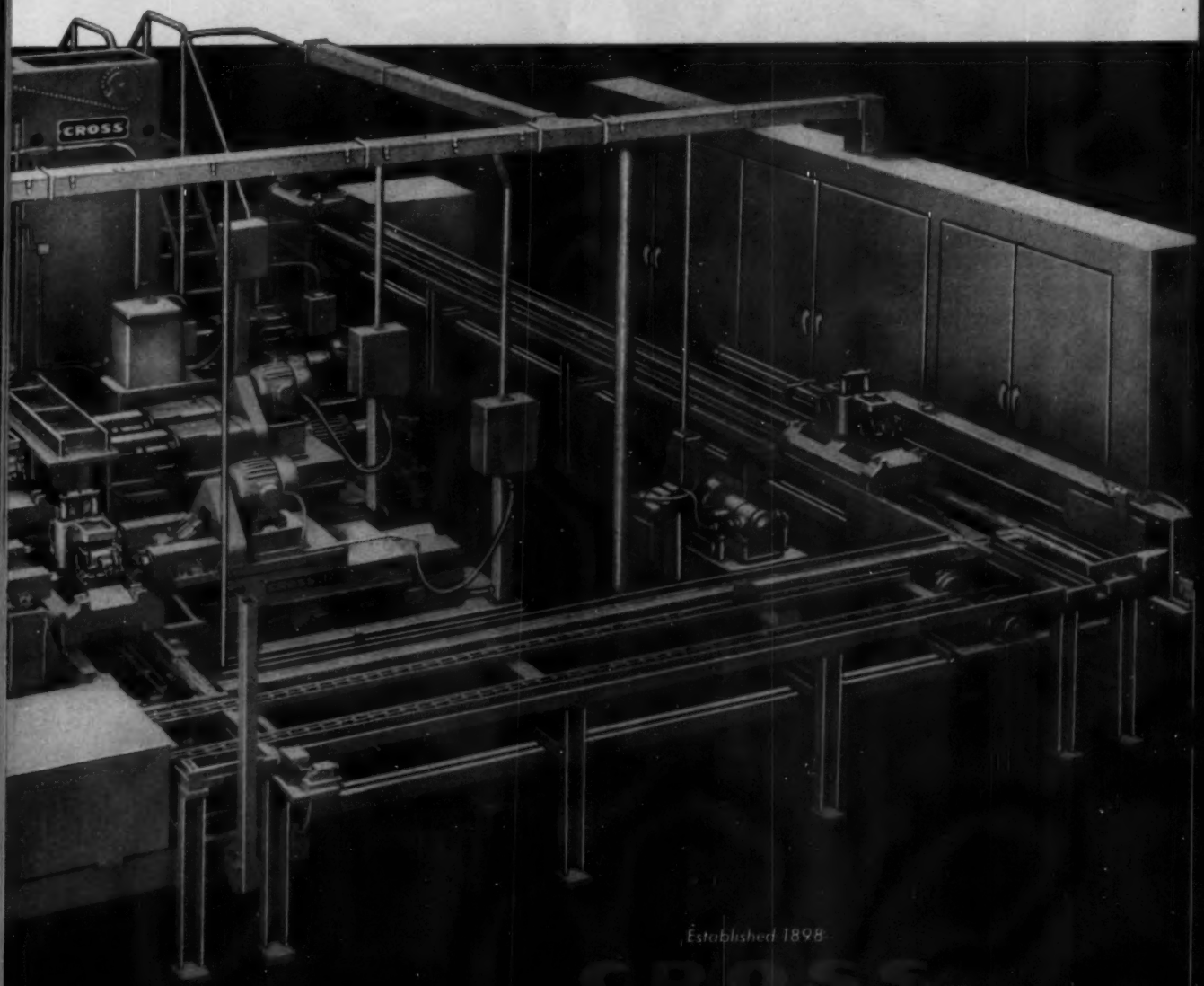
Another Automation First by Cross

An unusual new Transfer-matic which applies the production economies of automation to high precision finishing has been designed by Cross. It bores and faces transmission cases at a rated capacity of 140 parts per hour despite the rigid accuracy.

Some bore sizes are held to tolerances of plus or minus 0.00035 inch and chordal dimensions between three holes are held within plus or minus 0.001 inch. Squareness between the ends and bores is maintained to 0.0005 inch. Surface finish specifications are 56-110 micro-inches, rms.

A number of special features have been developed to assure this high precision. Center bases and wings are integral to obtain the rigidity necessary for maintaining precision alignment. Pallet locating is designed to assure extreme accuracy from station to station. Strategically placed air jets check the position of the pallets in each station.

A Cross sales engineer will be glad to explain details of this unusual Transfer-matic and other Cross innovations.



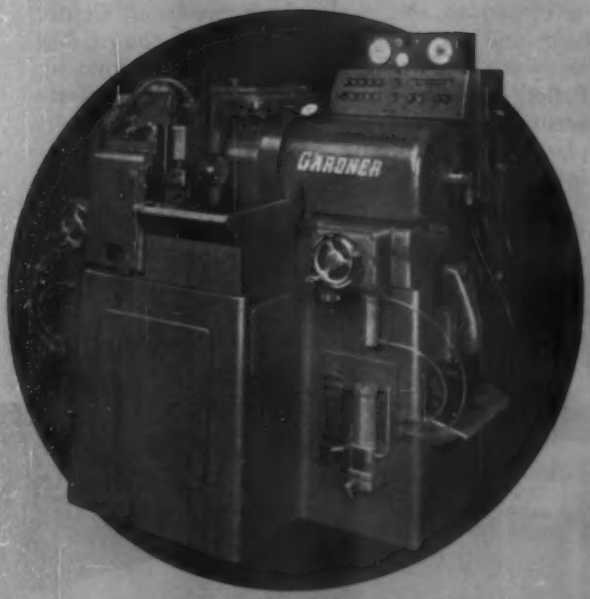
Established 1898

THE CROSS CO.

First in Automation

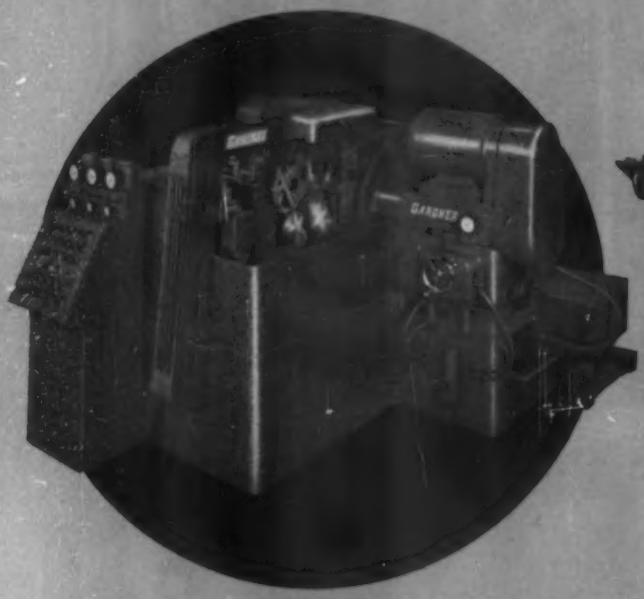
PARK GROVE STATION • DETROIT 5, MICHIGAN

see Gardner...

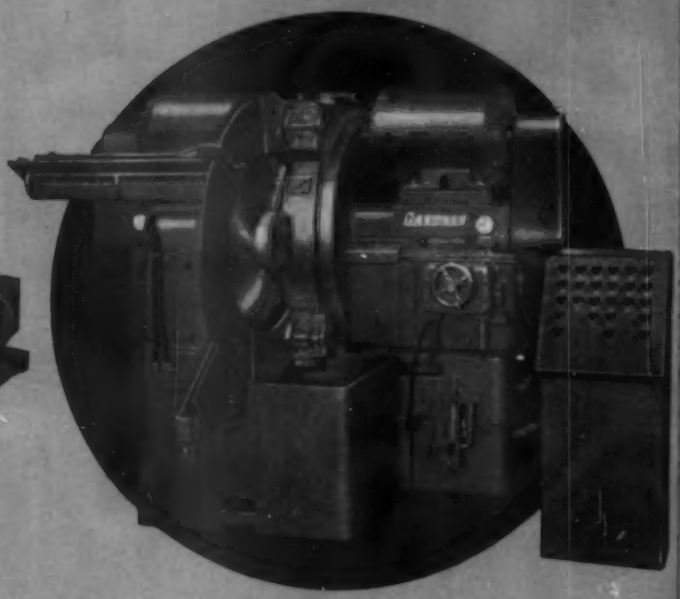


2H10–15"
Completely new machine grinds sides of instrument bearing inner races to ultra-precision tolerances.

2H20–23"
Grinds both ends of 15,000 bearing rollers per hour. Completely automated—loading, grinding, unloading.



2H30–30"
Complete automated grinding of universal joint spiders including dressing and mechanical work indexing.

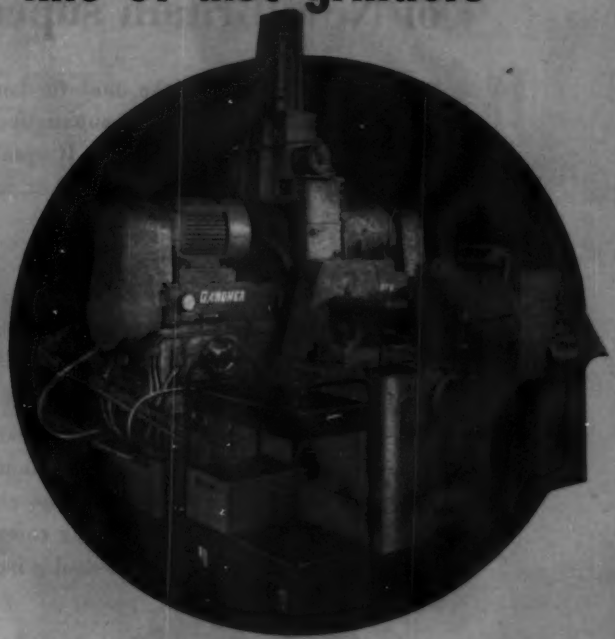


2H40–42"
Unequal areas of parallel sides of large, thin aluminum workpieces ground in rotary work carrier.

booth 811 ..... MACHINE TOOL EXPOSITION

the newest developments in disc grinding
the world's most complete line of disc grinders

1H20–23"
Completely new single spindle grinder with automatic work handling and in-process gauging. Grinds valve ends.



2H30–30"
Grinds bi-metallic thrust washer to flatness and parallelism of .0005". Features new shake-free ball dresser.

2V18–18"
Grinds both sides of small gears, in one operation, to .0003" flat and parallel.

new designs
new features
new methods

GARDNER

precision disc grinders
abrasive discs

BELOIT, WISCONSIN

Open secret of New Britain superiority

Wide-open design makes the most fundamental difference between a New Britain automatic chucking machine and other machines. It speaks for itself as a means of getting at the tooling, making adjustments and clearing chips.

Massiveness, right from the floor up, is equally apparent and equally important in chucker work. You see it in the way the cutting tools make the heaviest cuts with a chatter-free smoothness that can't be duplicated.

Only New Britain provides a combination of longitudinal with transverse forming motion where needed. This versatility eliminates the need for second operation machines in many cases—particularly when a job is setup for double indexing for fast two-at-a-time production.

New Britain spares no pains to incorporate every new development to make chucker-type machining more profitable. The open-end design lends itself particularly well to magazine loading and unloading, for example, and many New Britains are being equipped to provide this feature.

Whenever a number of operations are required on cast or forged pieces, these massive, rugged, powerful machines offer great possibilities for savings through faster, more accurate, more reliable production. A new and complete catalog on the New Britain chucker line is just off the press. We would be very glad to send you your copy.

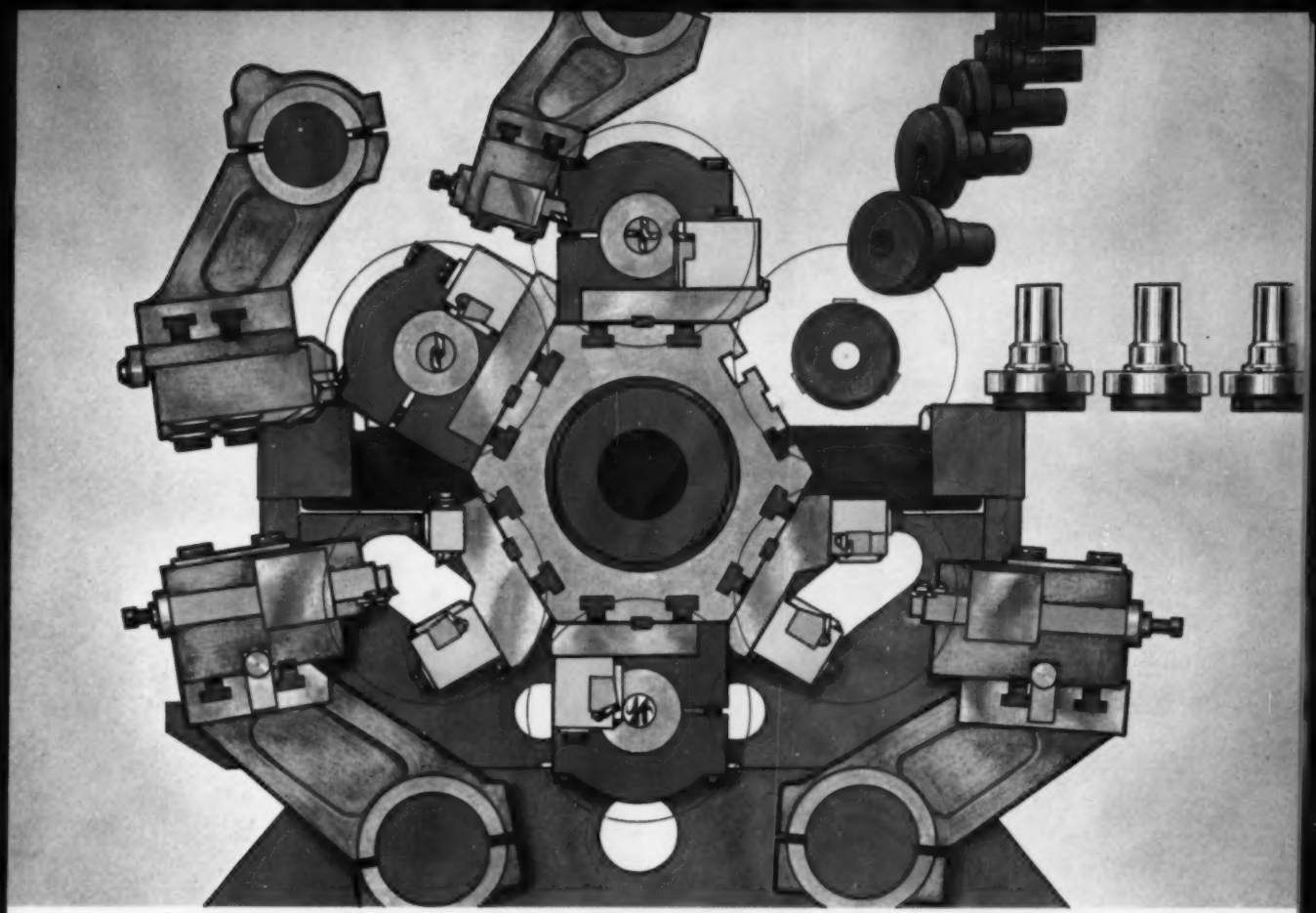
THE NEW BRITAIN MACHINE COMPANY

New Britain's answer to a serious threat

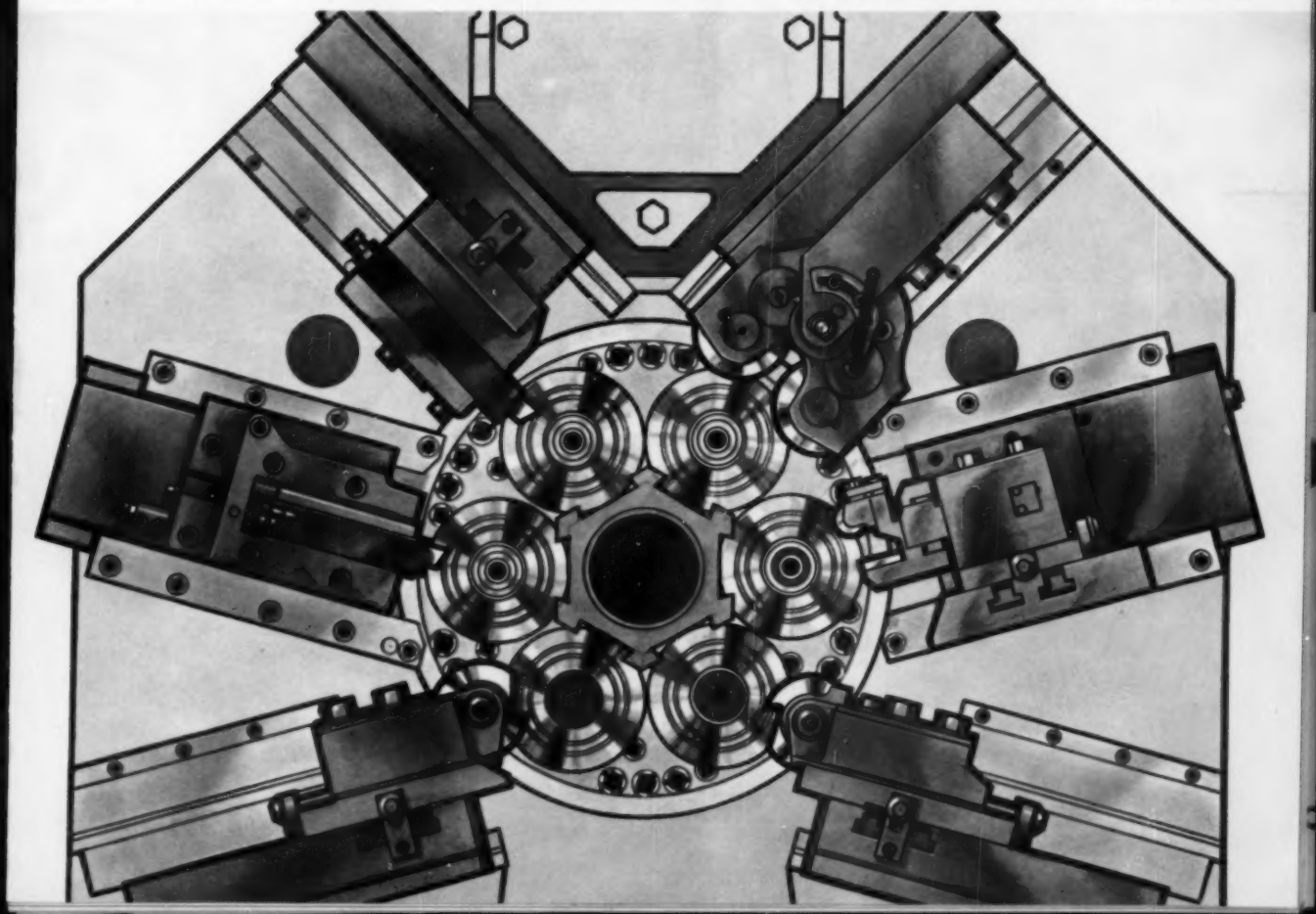
Overseas production of just about anything you care to name is making serious inroads on American domestic and foreign markets. It's no secret that European and Asian industry is catching up fast technologically—and they have a real competitive advantage in plenty of low cost skilled labor. While many foreign products are still inferior to those of domestic manufacture, this is far from true in all cases. The answer is, of course, increased productivity at lower cost.

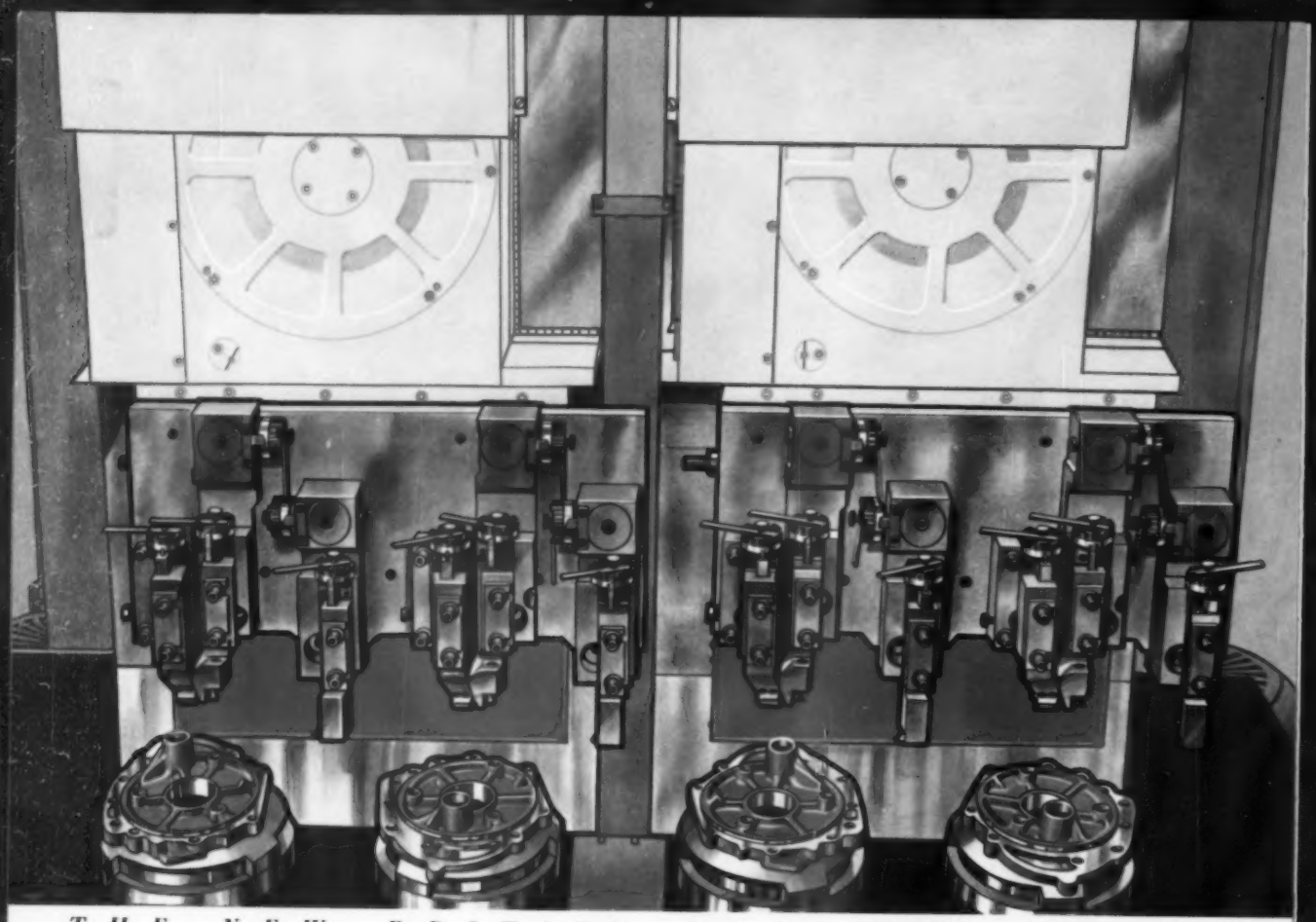
In its all-new line of bar machines, New Britain has developed the most modern bar-turning units available. Five models in two different series are offered with capacities from 1¼" to 5⅛". These machines are designed for really fast, trouble-free, high-precision production. More operations per machine are possible than ever before. Wide open tool areas allow unlimited combinations of end working and forming tools. New Britains will stay new longer. The exclusive wear-preventing features so familiar to New Britain users have been retained and improved. Catalogs on both the small and large series machines are yours for the asking. After looking this literature over if you think one or more New Britains may help improve your competitive situation, we will be happy to review your prints and arrange a demonstration. No obligation, of course. Call us or call your local representative.

New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

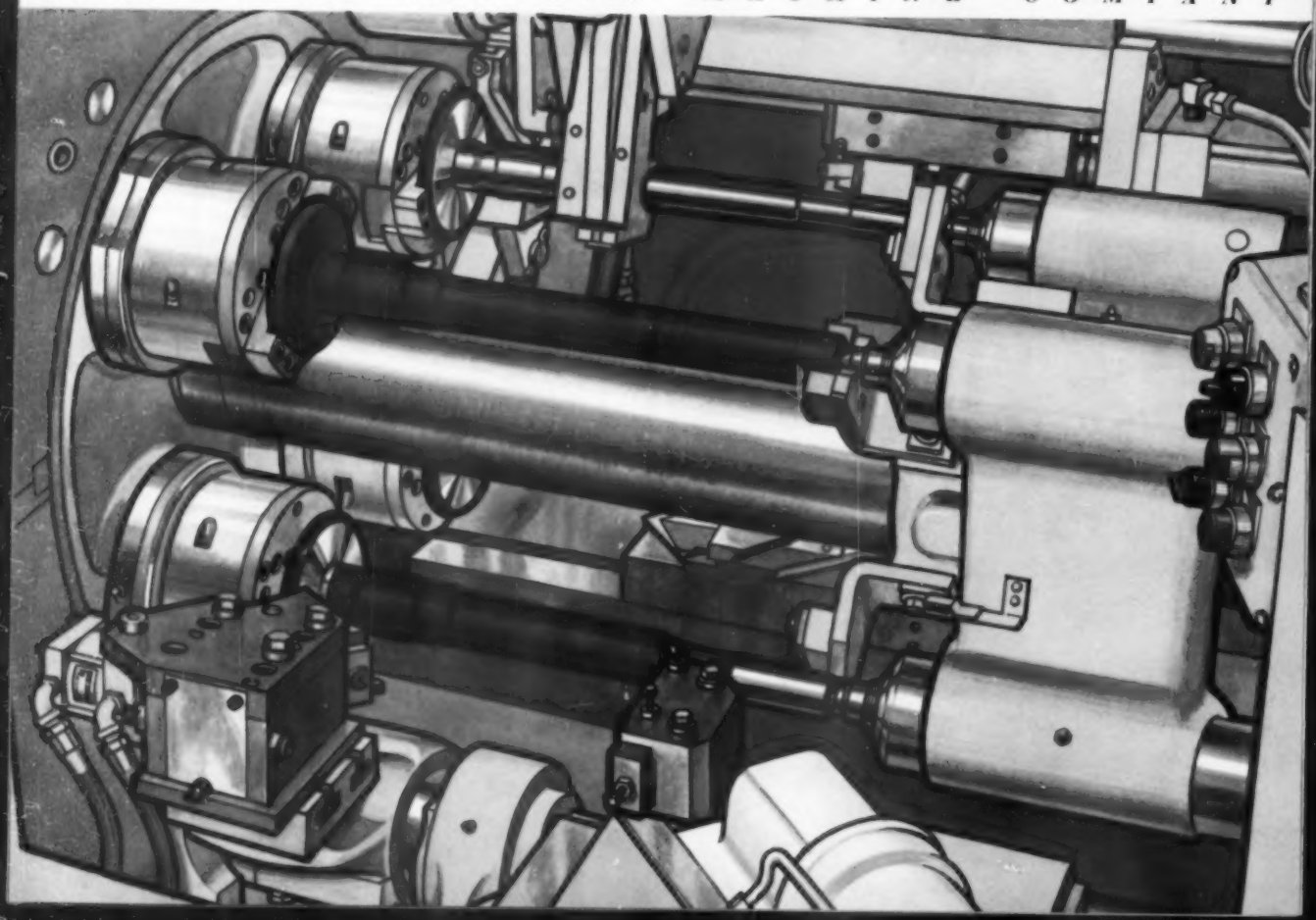


NEW BRITAIN · GRIDLEY MACHINE DIVISION





THE NEW BRITAIN MACHINE COMPANY



(Advertisement)

Precision boring
New Britain's new approach

New Britain Cam Actuated Vertical Precision Boring Machines offer an entirely new principle for more accurate boring and turning, plus compact exterior design and fast tooling. Rough cuts and finish cuts within close tolerances on the same set-up are characteristic. Standard models are available with maximum swing from 12″ to 17¾″ in 10 or 15 horsepower.

Here are a few of the major new developments incorporated in these unusual machines.

Greater accuracy. Both the vertical and cross slide cams are mounted on a common shaft which is contained inside the vertical slide. The linkages found in conventional cam-operated contouring machines are eliminated. Both the vertical and cross slides ride on preloaded roller bearings and are deflection-free.

Clean-sided design. Any number of these self-contained machines, each with one or more spindles, can be arranged side by side. Depending on how they are tooled, they operate either as a single unit or as individual machines. Parts can be inverted on adjacent machines or on adjacent spindles of the same machine, finishing both sides, completing *all* operations in one integrated, high-volume operation.

Fast tooling. Unrestricted accessibility allows rapid tool and cam changes.

Complete catalog material is available.

NEW BRITAIN · GRIDLEY MACHINE DIVISION

Idea for volume producers of shafts

Economists are making startling predictions on this year's increase in productivity. They say it will be twice that of recent years—up as high as 10% in some manufacturing industries.

Whether or not these predictions come to pass, it's certain that it won't happen in plants using outdated equipment.

Shaft work is a problem to many firms. New Britain pioneered template-controlled contour turning and boring, solving the problem for many progressive companies. Now for the manufacturer with really high volume requirements we present Model 412/25–a four-spindle, template-controlled machine capable of producing a four-fold increase in productivity per man hour.

The basic principle pretty much speaks for itself. As in the case of the single-spindle contour lathe, inexpensive metal templates control the full cycle and re-cycle if required. Simple, single-point tools replace complex gang tooling. Setup is simple and fast. When tools wear, merely replace them. Since all relationships are maintained by the template, tool replacement involves no problem.

When the volume of contour turning warrants it, this machine can be the best money maker on the production floor. Your New Britain representative can quickly tell you after looking at your prints and learning of your production requirements. Meanwhile, we would be glad to mail you descriptive literature containing the basic facts and specifications. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

OK, OK . . . SO YOUR NEW ALL-ELECTRIC IMPACT HAMMER IS FAST - BUT WHAT ELSE WILL IT DO FOR ME?

Fair question. ELECTROPUNCH is fast. Up to 300 controlled blows per minute. Up to 10,000 lbs. impact. Swift lift for any light assembly production line. But not just fast. No. Versatile. Excellent for staking, riveting, punching, swaging, crimping, marking, etc. Mobile, too. Oh yes. Takes up mere square foot of bench. Fits any production line — just plug it in. Electric, you know. Won't affect air line requirements. Never have to buy new air compressor or any of that costly business. Saves utility costs like bees save honey. And, speaking of saving: No maintenance. Just two moving parts — yet durable as Gibraltar. Easy, effortless operation — but really effortless. Easiest of all on budget. Blush to mention actual figure. But cost is lower than for any comparable equipment. Get facts. Write: **BLACK & WEBSTER, INC.** Dept. 3, 570 Pleasant St., Watertown 72, Mass.

PHONE: WALNUT 6-0100

NEW IMPROVED SERIES 4 ELECTROPUNCHES — MODEL BS

Impact, 3500 lbs. (others to 10,000 lbs).

Length of stroke — 1¼"

Cycles per minute, full stroke — 120

Maximum shut height — 5½"

Column Height — 12"
(18" column slightly extra)

Throat depth — 4"

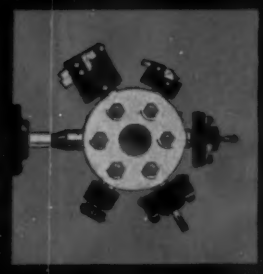
Tool hole in spindle — .500-.502x 1" deep

Bench space — 9¾" x 9¾"

Weight — 50 lbs.

Power consumption —
111,000 strokes for 1 KWH

115V., or 230V., AC, 50-60 cycle, 1 phase



See what's NEW at Booth 452

to help you make more for less...

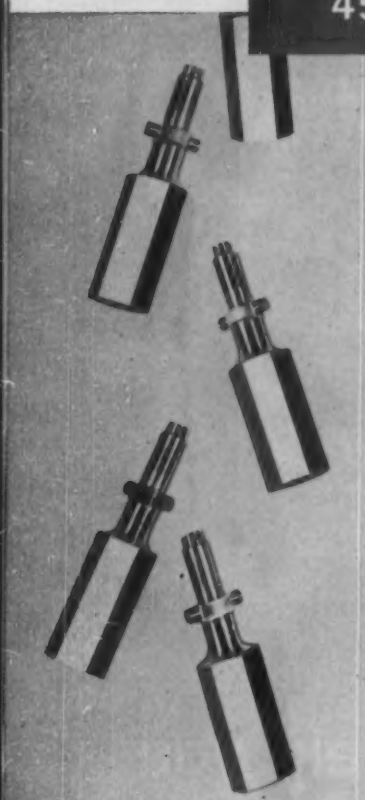
Brown & Sharpe
PRECISION CENTER

MMT·PE
MACHINE TOOL EXPOSITION
1960

MMT·PE

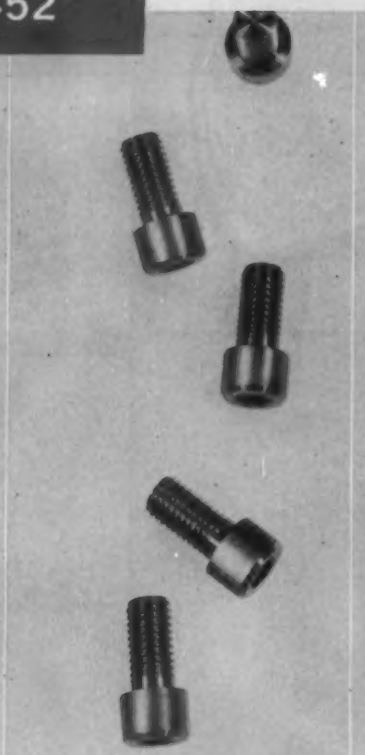
See what's new at Booth 452

TO HELP YOU MAKE MORE
FOR LESS WITH SCREW MACHINES



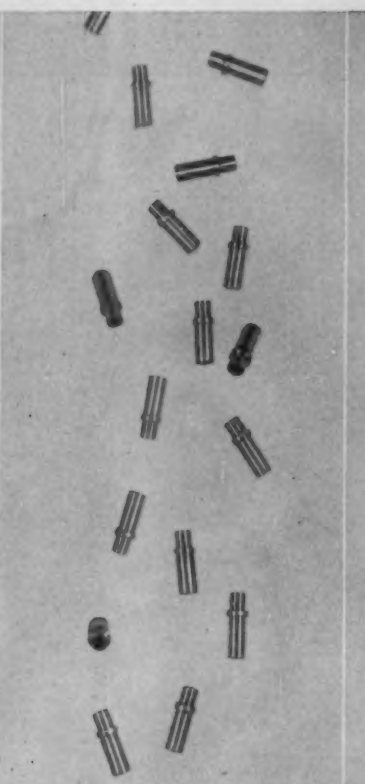
NEW fourth slide permits added operations in cycle

Upper front forming slide has 2 tool holders for turning right or left hand. At upper back is cut-off slide. Both slides are interchangeable.



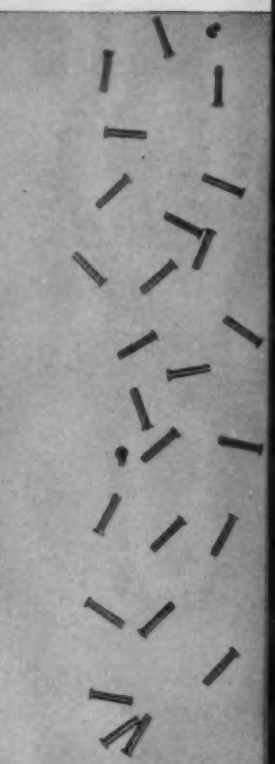
NEW drilling & broaching attachment extends work range

Picks up cut-off piece, drills back end and punch broaches with 18,000 lb. pressure (generated from 80 lb. air). Or, broaches front end.



NEW electronic gaging holds closer tolerances

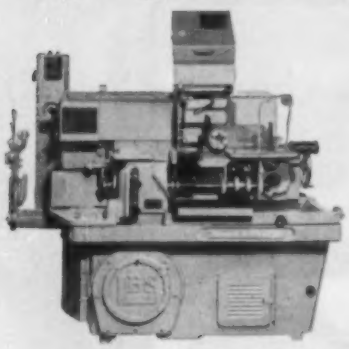
Comparator checks each part from transfer mechanism — shuts off feed at first bad part. Operator resets tools fast by observing "over-under" lights.



NEW faster feeding boosts small diameter parts production

10,000 rpm provided in bar f mechanism by auxiliary t stops spindle liner momenta when stock is fed. Elimina centrifugal problems.

Brown & Sharpe Automatics show dramatic progress in output speed, accuracy, and adaptability



New-design advantages like these in Brown & Sharpe's new Automatic Screw Machines can boost your production rates as much as 100%. Brown & Sharpe is constantly at work improving Nos. 00, 2 and 4 Automatics — to save you money — to give you even better precision and finish — to increase machine adaptability for different types of work.

These four examples of continuing B&S design leadership will be dramatically demonstrated at Booth 452. Stop in and see for yourself why plants that replace old equipment with new B&S automatics can write off the investments in record time, with daily dollar savings. Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

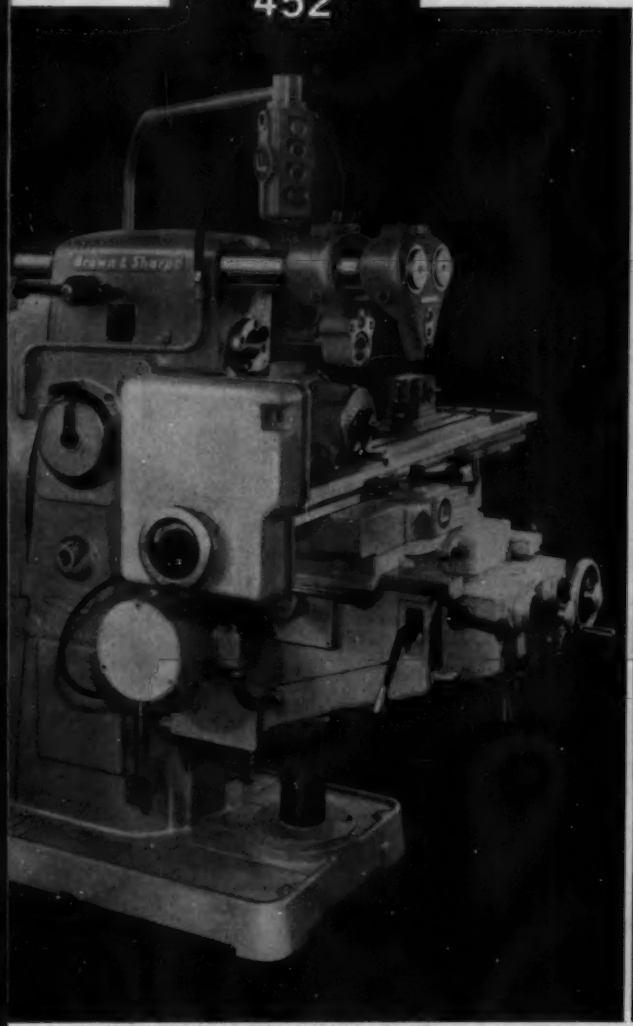
CIRCLE 729 READER SERVICE CARD

Brown & Sharpe PRECISION CENTER

MMT-PE

See what's new at Booth 452

TO HELP YOU MILL MORE FOR LESS



NEW B&S No. 2 Universal Milling Machine

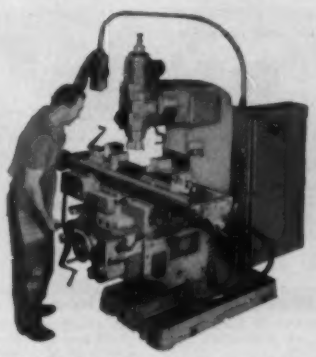
NEW B&S No. 2 Plain Milling Machine

Introducing 14 new B & S DYNAMASTERS - No. 2 Plain, Universal, Vertical; and Rangemasters - 3, 5, 7.5, 5/10 hp

You'll see something new from every viewpoint in the B&S No. 2 Milling Machines on display in Booth 452. And, whatever your specific needs, you'll see why the new series provides every feature you want for top efficiency and economy in your milling operations. Construction with standard units offers a choice of 132 cost-cutting combinations, permits you to select a machine "custom built" to your needs, ready for prompt delivery. The B&S Rangemaster® sliding head type machine, also exhibited, incorporates many of the same advantages.

You'll also see the B&S NUMERICAM Tape-Controlled Cam Milling Machine, which saves up to 90% in cam production costs — and the new Deep Hole Drilling Machine that eliminates the need for expensive fixtures.

See them all at Booth 452 . . . or write for full information. Machine Tool Division, Brown & Sharpe Manufacturing Company, Providence 1, Rhode Island.



NEW B&S No. 2 Vertical Milling Machine

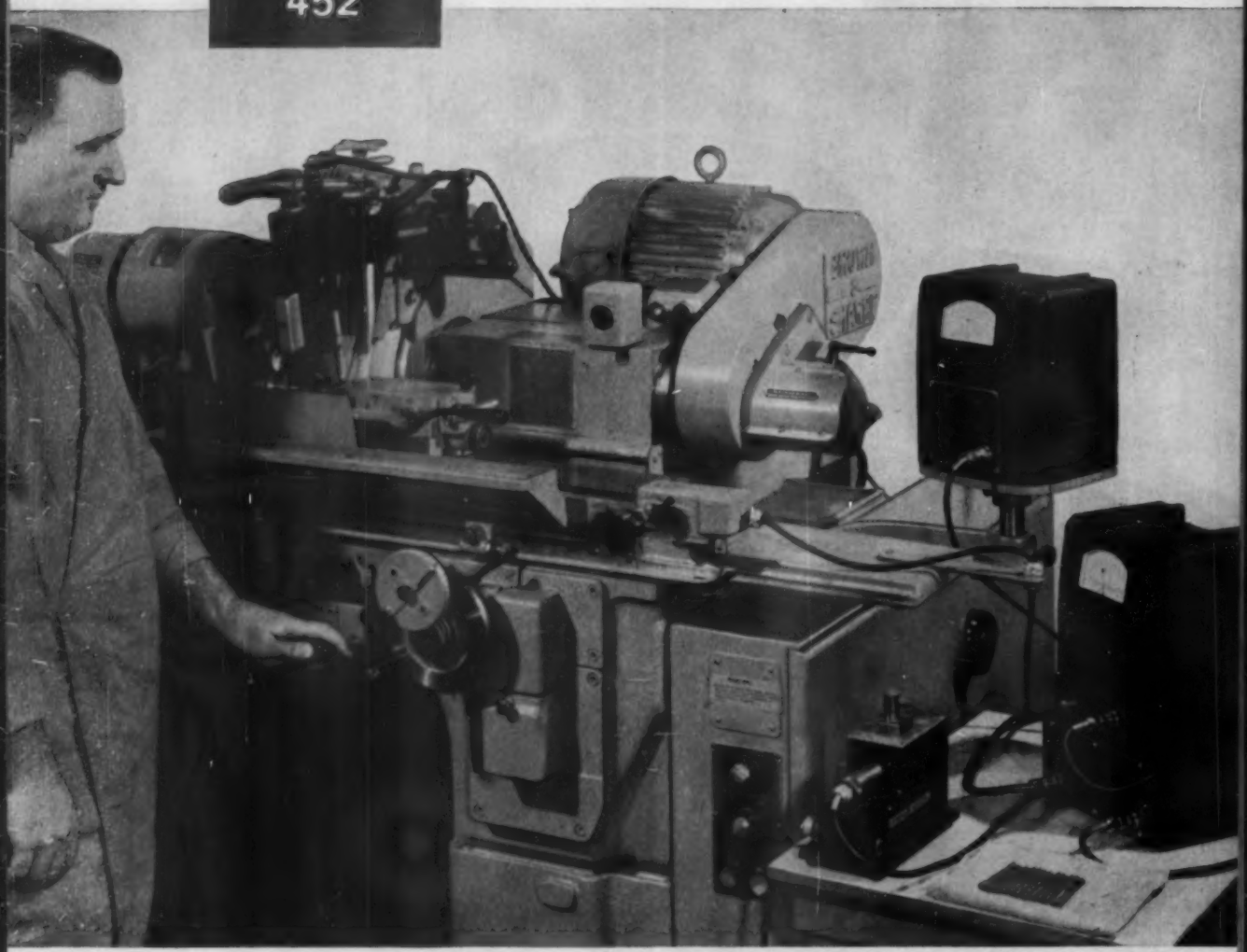
Brown & Sharpe PRECISION CENTER

CIRCLE 730 READER SERVICE CARD

MMT·PE

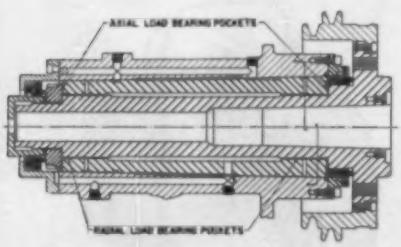
See what's new at Booth 452

TO HELP YOU GRIND MORE FOR LESS



New Brown & Sharpe No. 5 Plain Grinding Machine with CEDA/SIZE arrangement.

Brown & Sharpe pioneers new concepts in precision with production grinding to ±0.000010" or less



New Supercise Headstock with hydrostatic spindle bearings for B&S Universal Grinding Machines.

At Booth 452, you'll see the Brown & Sharpe Grinding Machines that are eliminating the slow, high cost methods of sizing to ultra-close tolerances. Demonstrations of the new No. 5 Plain Grinding Machine with CEDA/SIZE show how any size that can be measured can be *duplicated*, within millionths, *by plunge grinding* — with average operators, on a production basis.

Partner in precision is the B&S No. 2 Universal Grinding Machine with the new hydrostatic headstock, which produces split-tenth sizing and super finish.

On display also are the new MICROMASTER 824 and 1030 Surface Grinding Machines, which offer all the advantages of the B&S No. 510 and 618 MICROMASTER Surface Grinders, in machines of greater capacity.

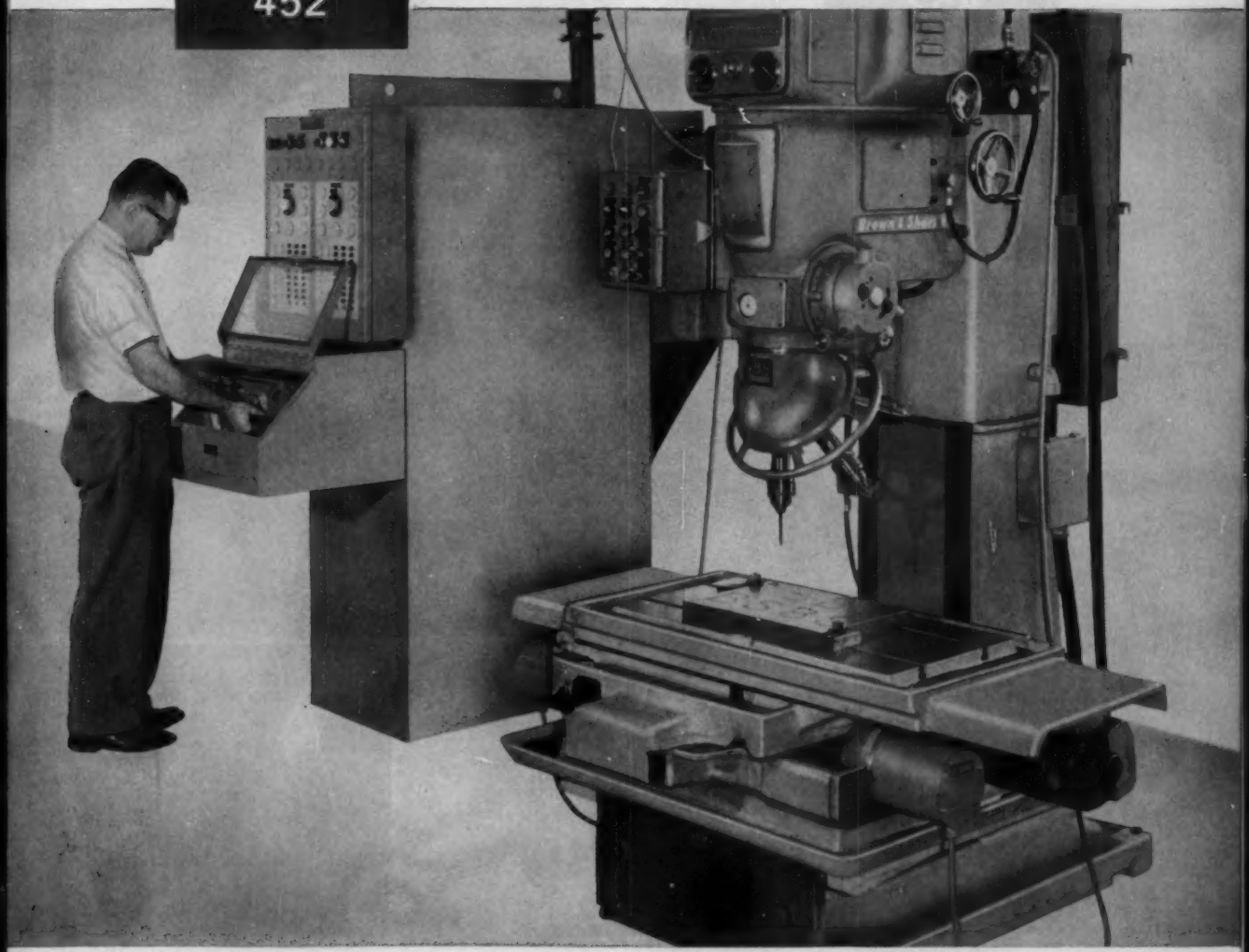
Bring your information on grinding progress up to the minute. Visit Booth 452 . . . or write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence, R. I.

Brown & Sharpe PRECISION CENTER

MMT-PE

See what's new at Booth 452

TO HELP YOU DRILL AND TAP MORE FOR LESS



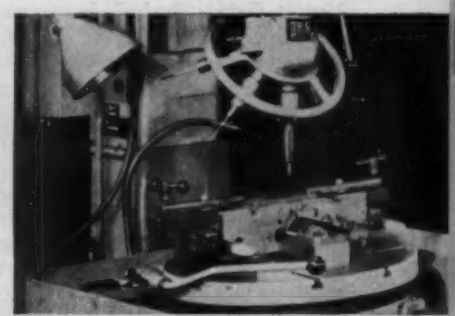
New B&S Model B Turret Drilling Machine with tape-controlled table.

New B&S tape-controlled Turret Drilling permits up to 75 to 1 reduction in tooling costs

Brown & Sharpe Turret Drilling Machines and Work-Positioning Tables regularly score production gains as high as 5 to 1 over conventional gang-drill box-jig methods, with manual or automatic operation. Now, tape-control adds tooling cost savings as high as 75 to 1.

This revolutionary advance in automation of drilling, tapping, reaming, and boring is on view in Booth 452. Completely automatic, fully integrated locating and machining operations are performed by the B&S Model B Turret Drilling Machine and the B&S Work Positioning Table, guided by a tape control.

Plan now to see this dramatic demonstration if you attend the Exposition . . . or write for details: Machine Tool Division, Brown & Sharpe Manufacturing Company, Providence 1, Rhode Island.



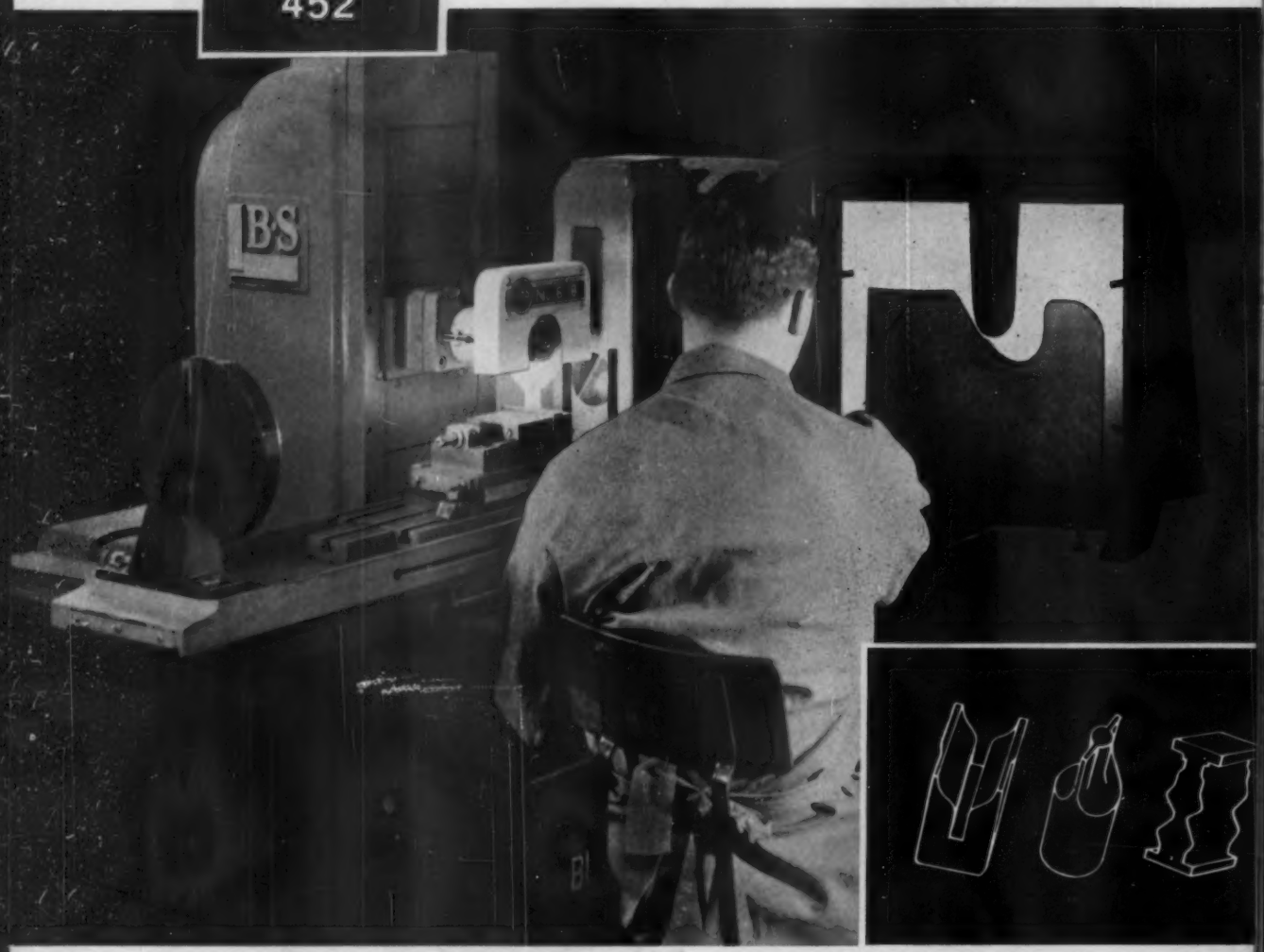
Manually operated Model A B&S Turret Drilling Machines and Positioning Tables provide jig-less drilling at low cost.

Brown & Sharpe PRECISION CENTER

MMT-PE

See what's new at Booth 452

TO HELP YOU GRIND MORE FOR LESS



Up to 300% faster form grinding in carbide, ceramics – Brown & Sharpe MICROMASTER with VISUAL GRIND

VISUAL GRIND, the built-in comparator on the B&S 618 Surface Grinding Machine, permits tool and die makers to meet today's demand for intricate shapes in super-hard materials with spectacular savings in work hours and wheel costs.

Skilled operators can save up to 300% in set-up and grinding time. There is no need to remove work for frequent inspection with separate equipment. Semi-skilled workers, also, quickly learn to "follow the line," and match the clearly visible, true image of the work to the form layout drawn on the screen. Wheel costs are drastically reduced in grinding carbide and ceramics — any contours can be reproduced with a few simple wheels.

An unlimited variety of forms can be produced in punches, dies, and similar work — with through, blind, or template grinding — using standard equipment and simple attachments.

The MICROMASTER® with Visual Grind provides all the extra profit-saving advantages of the new B&S 618 Surface Grinder. It can be readily used for other grinding, of surfaces up to 6" x 14", without disturbing the optical system.

THE VISUAL GRIND® system is manufactured by The Cleveland Grinding Machine Co. and is sold only by Brown & Sharpe. For details, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

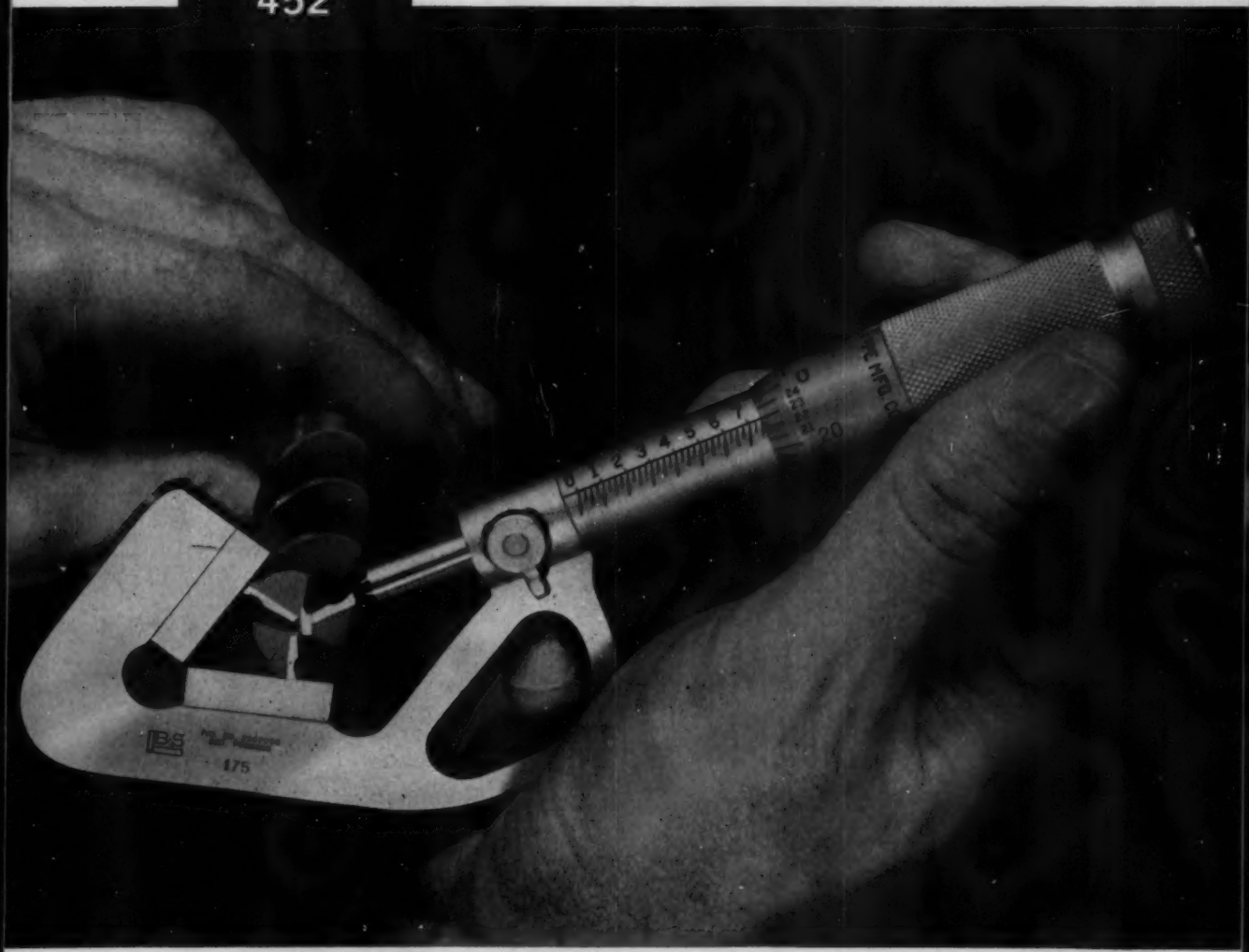
CIRCLE 733 READER SERVICE CA

Brown & Sharpe PRECISION CENTER

MMT·PE

See what's new at Booth 452

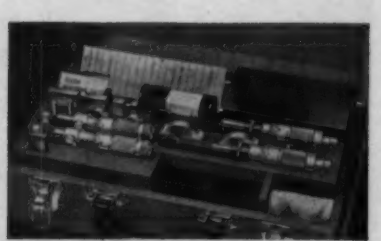
TO HELP YOU MAKE PRECISION MEASUREMENTS EASIER AND FASTER . . .



New B & S "Tri-Mike" measures diameters of 3-flute cutters – reads fast, works easily in one hand

You can measure 3-flute cutters in seconds with this new Brown & Sharpe Tri-Mike — or check the roundness of centerless-ground stock. Tri-Mike's finger hole makes it easier to grip than other tools of this type. Slanting barrel graduations that "can't hide" prevent 25-thousandth errors. Other features: Carbide-faced anvils and spindle; convertible thimble action; thumb-operated, "wrap-around" lock. Range: .093" to 1.000", by thousandths.

B&S low carbon "Thrift" Stock costs 60% less than oil-hardening precision stock. 265 packaged sizes available identified full 24" length. Ground to 35 micro-inches or better.



B&S Micrometer Inspection Kit helps any shop keep micrometers uniformly accurate, without sending them out. Includes spare mikes, standards, and maintenance materials.

CIRCLE 734 READER SERVICE CARD

Brown & Sharpe PRECISION CENTER

TAKE THE LONG

Plan for tomorrow's needs, today!

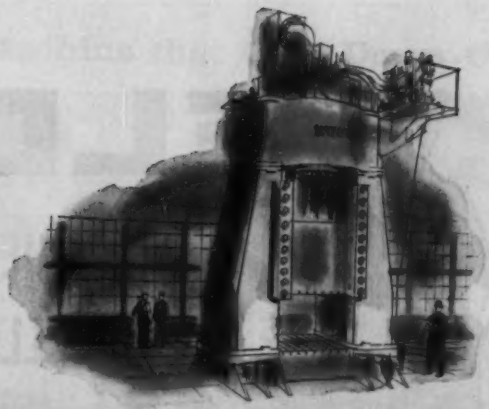
An R. D. Wood Press can be the key to better production capacity needed today . . . and equally efficient capacity in a growing economy in the years to come. In terms of today, you replace worn out equipment, increase production rates and cut excessive downtime. For the long pull, you are in a position to produce top quality products with top operating efficiency and stay on top of heavier production schedules with equipment that can still deliver . . . day, after day, after day.

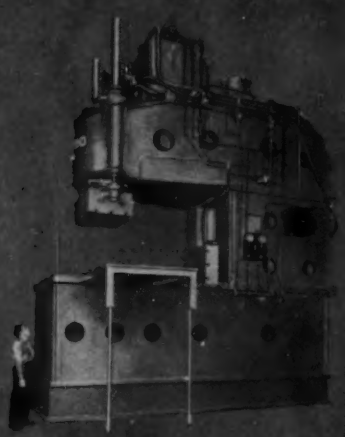
Check the stamina story of R. D. Wood Presses, today. The long-range sure economy, too. Write for information on the type of press or presses that you require.

The presses illustrated here are representative of the complete line of hydraulic presses and valves produced by R. D. Wood Company. All of those shown are available in various capacities and others are available for different operations. Write to R. D. Wood Company for recommendations on the press to suit your specific problem.

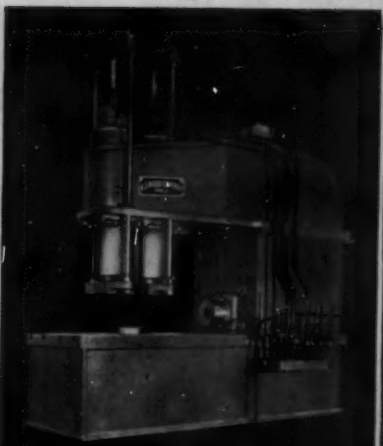
R. D. WOOD COMPANY
PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

LOOK!



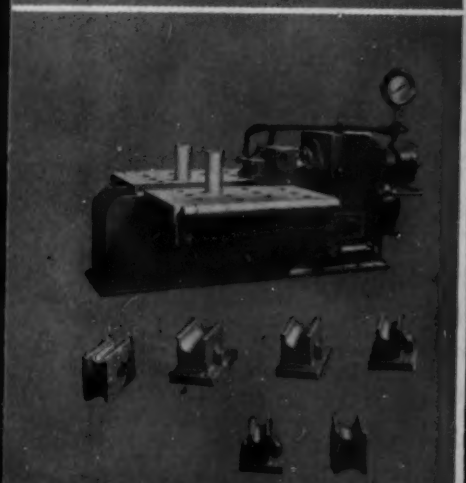


For Straightening Operations—Machine Number 8775, HydroLectric open-gap press. Capacity, vertical ram, 750 tons, horizontal ram, 400 tons; gap, 7'0"; vertical daylight, 4'6"; height of press, 26'5"; floor space, 21'10" x 20'0".



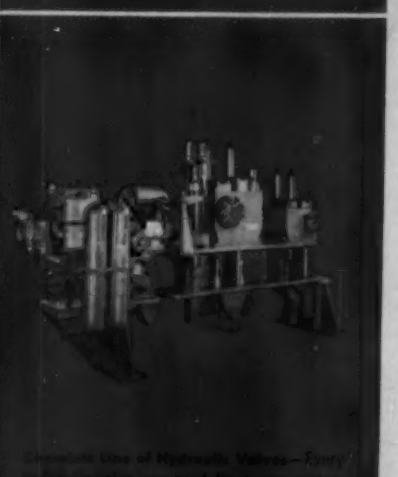
For Flanging Operations—Machine Number 8487, sectional hydraulic flanging press—also for joggling and upsetting operations. Capacity with vertical rams in unison, 300 tons; horizontal ram, 115 tons; stripper ram (in bed), 115 tons; gap, 5'0"; vertical daylight, 3'9"; height of press, 15'9", floor space, 5'0"x14'2".

For Forming and Forging Operations—Machine Number [illegible] hydraulic press). Capacity, 1,500 tons; moving platen size, 11'6" x 4'2"; ram stroke, adjustable, 1'9"; height of press, 39'; floor space, 18'0"x15'6".



For Pipe Bending Operations—Machine Number 9089, horizontal cold-bending press, complete with self-contained pumping system. Capacity, 25 tons; stroke of ram, 11"; table size, 2'8½"x4'2".

For Tube Testing Operations—Machine Number 9284, hydrostatic tube testing machine. Capacity, 4½" to 12" OD tubes, maximum tube length, 35', test pressure, 700 to 1,500 psi; average production (12" tubes, 35' long), 30 per hour; floor space required, 5'0"x45'0".



Complete Line of Hydraulic Valves—Every [illegible] valve you need for a new system or [illegible] an existing installation. Choose from a complete line of stop valves, check valves, operating valves, safety relief valves, shock absorbers, accumulator control valves and a large variety of special valves.

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EXTRA HEAVY DUTY END MILLS and HOLDERS

New 2½" SHANK

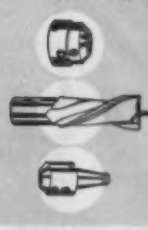
Rugged Dependability for your Toughest Jobs

OVER 40 YEARS OF LEADERSHIP SINCE 1918

A complete line...

- 2½" diameter shanks
- 3" diameter of cut
- 12" length of cut

Write for more details



THE WELDON TOOL COMPANY

3000 Woodhill Road • Cleveland 4, Ohio

A NEW Band Saw Machine that Cuts Down Cut-off Costs

Get the Complete Dollars-and-Cents FACTS . . .

. . . and see for yourself why the many exclusive design and construction features built into the Milband Band Saw Machine Tool will give you important benefits like longer blade life, faster cut-off sawing, increased production, greater accuracy and lower cost-per-cut.

The Milband is specifically designed and built to provide the extra ruggedness, rigidity and construction refinements needed to operate high speed band saw blades with full efficiency. Facts about this machine – including comparative time-and-cost figures obtained from actual performance tests – are featured in the new circular shown here. Use the handy coupon below to send for your free copy . . . today! There's no obligation, of course.

MILBAND MACHINE TOOL DIVISION

THE HENRY G. THOMPSON & SON CO., NEW HAVEN 5, CONNECTICUT

Saw Specialists for Over 80 Years

THE HENRY G. THOMPSON & SON CO.
271 Chapel Street New Haven 5, Connecticut

Gentlemen: Please rush my free copy of Thompson Circular No. 502, giving the complete facts on fast, low-cost production cut-off sawing with the MILBAND Band Saw Machine.

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Company_____

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City_____ Zone____ State_____

FOR IMMEDIATE RELEASE

Press Release from: JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U.S.A.

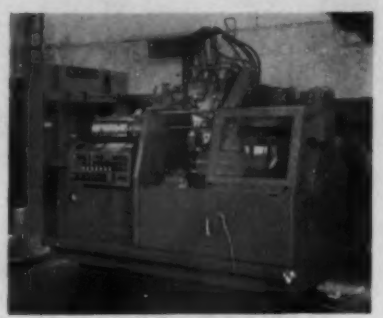
for all publications, on machines for N M T B A Exposition.

J&L's Booth #839 at the NMTBA Exposition in Chicago will include turret lathes ranging from a standard, manually-operated #3 Ram Type Turret Lathe up through an entirely new line of machines with automatic transmissions. Highlights of the J&L exhibit will be an all-new, completely automatic, electro-mechanical machine; and the world's first production model of the Jones & Lamson Numerically Controlled Turret Lathe. Machines will be in operation on actual production jobs.

J&L Numerical
Tape Control Turret Lathe

Among other production-proven turret lathe operations, you will see multiple tooling on a two-dimension turret lathe tracing unit, and the remarkable Jones & Lamson auto-threader, which provides completely automatic cycling for single-point thread chasing.

Moving on to other high production machines, Jones & Lamson will have in operation three different variations of the all-new family of Model 30 Single Spindle Automatic Turning and Tracing Lathes. The basic machine is of bridge-bed design for maximum rigidity, and offers extreme versatility of tool motion, ease of loading and unloading (manual or automatic), as well as ideal conditions for chip removal.



J&L 60° Model 30
Automatic Tracing Lathe

The three machines in operation will be set up as follows: One is a Multiple Slide Single Spindle Automatic (machining a production run of crankshafts). Another is a 60° Automatic Tracing Lathe (performing high-production work on steering knuckles). The third machine will demonstrate multiple tooling of Two-Dimensional Tracing on a series of different sized gear blanks.

All of these machines feature a wide range of spindle speeds (up to 32), with automatic speed and feed change during a cut. A variety of components may be added to the base machine to meet specific requirements demanded by the individual customer's work. For instance, a rugged 6" hydraulic ram tailstock is mounted on the lower bed for between centers work. Multiple tooling may be applied to a rear forming slide, or a rear facing, forming and turning slide - also mounted on the lower bed. Two bevel facing, or necking slides (one light-duty, one heavy-duty) are available for mounting on the front side of the lower bed. The upper bed may carry a multiple-tooled turning slide, a 60° tracing slide, or a 180° (two-dimensional) tracing slide. The two-dimensional slide is hydraulically controlled, and may be multiple-tooled for tracing operations using any one of eight different tool travel cycles - each of which controls tool motions through a full 180° of travel.

180° 2D Tracing
on J&L Model 30 Lathe

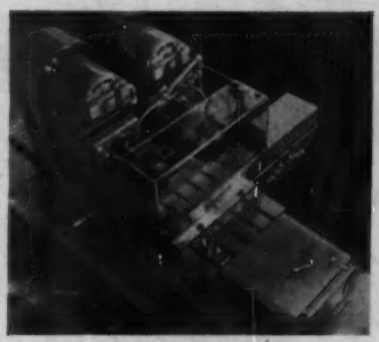
Two different headstock transmissions are available (16 speed or 32 speed) as well as two different spindle noses (6" A-1 or 8" A-1). The machine comes in three standard bed lengths - 24", 48", or 72". Controls are unique, reliable and extremely accessible. On re-order, for instance, set-up is accomplished in a matter of minutes simply by setting the graduated dog rings on the conveniently located control drum.

The new Jones & Lamson automatic form grinders will stimulate some new thinking. Perpetual Form Control (PFC) with cemented diamond cutters will be employed to show the advantages of high production, close tolerance grinding - with no time out for wheel dressing. A new PFC dresser with up to 12" of width for CDP cutters is one of the features of the new "Model E-3".

J&L Model F
Automatic Thread Grinder

Another machine being exhibited for the first time is the "Model F" Thread Grinding Machine, designed for high-production thread grinding of small parts. It is particularly applicable to thread grinding operations on all standard taps, with manual or automatic handling.

J&L will also introduce a brand-new, low-cost, small, Precision Thread Grinding Machine. Details of this machine are still considered as "classified", but will be released at show time. Watch for it. Originally it was to be designed specifically for satellite shops in the Electronics Industry, but its design has been amplified to include work performed in a larger segment of the metalworking industry.



J&L Double Spindle
Precision Boring Machine

The Precision Boring Machine is a relatively new member of the J&L line. It is low in price, but high in performance. Single or multiple spindle set-ups are available for close precision turning, boring, or facing operations. One of the demonstrations at the show (an actual production job) features the complete machining of both inside and outside surfaces of stainless steel cups in a single 20-second machining cycle.

Another new machine being introduced will be the J&L Precision Deep Hole Drilling Machine. This one will be performing a gun drilling operation on a 3/16" diameter hole, three inches in length.

Representative models of the extensive line of Jones & Lamson Optical Comparators and Measuring Machines will also be in operation at the J&L Booth #839. These will vary from the new economy-sized Model TC-10 with a 10" screen, up to the largest capacity 30" screen models.

Among the many optical inspection methods shown working on typical jobs will be the relatively new High Intensity Reflection Unit; the unique Mercury Arc Unit, that provides five times more illumination than any single filament type bulb; a new light concentrator for special applications; and a host of other innovations, including standard and special staging fixtures.

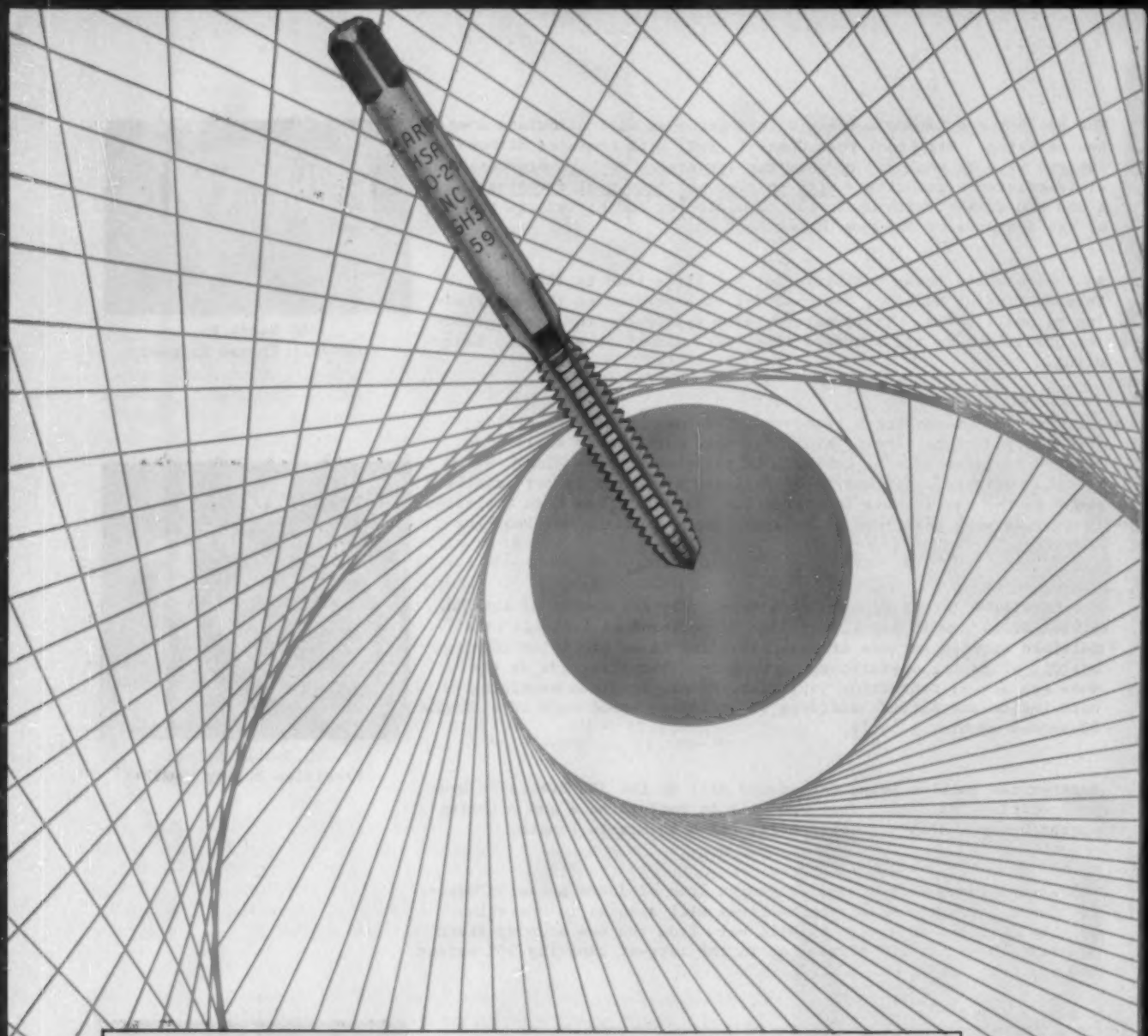
J&L Tape Controlled
Positioning Table

J&L's 20" x 20" Positioning Table will also be in operation under one inch, 8 channel tape control, with electronic hydraulic servo control for end point positioning.

The Positioning Table will be set up in conjunction with a Standard Post Drill, to demonstrate the speed, accuracy, and minimum set-up time required with tape control on small or long-run production.

The famous "no approximations" Jones & Lamson thread tool line will also be on display. This line includes Automatic Opening Tangent and Radial Type Die Heads, Collapsible and Solid Adjustable Taps, and the time-saving Modern-Magic chucks and collets.

"The Man Who Needs a New Machine Tool Will Find it in Booth #839"



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Each CARD tap of same type and size is precisely, geometrically duplicated, bringing valuable production benefits to every user. For more dependable performance, longer service life, specify CARD taps. See your CARD Distributor for all types of taps, dies, gages and screw plates. Call in your CARD technical man for valuable aid in selection and use. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

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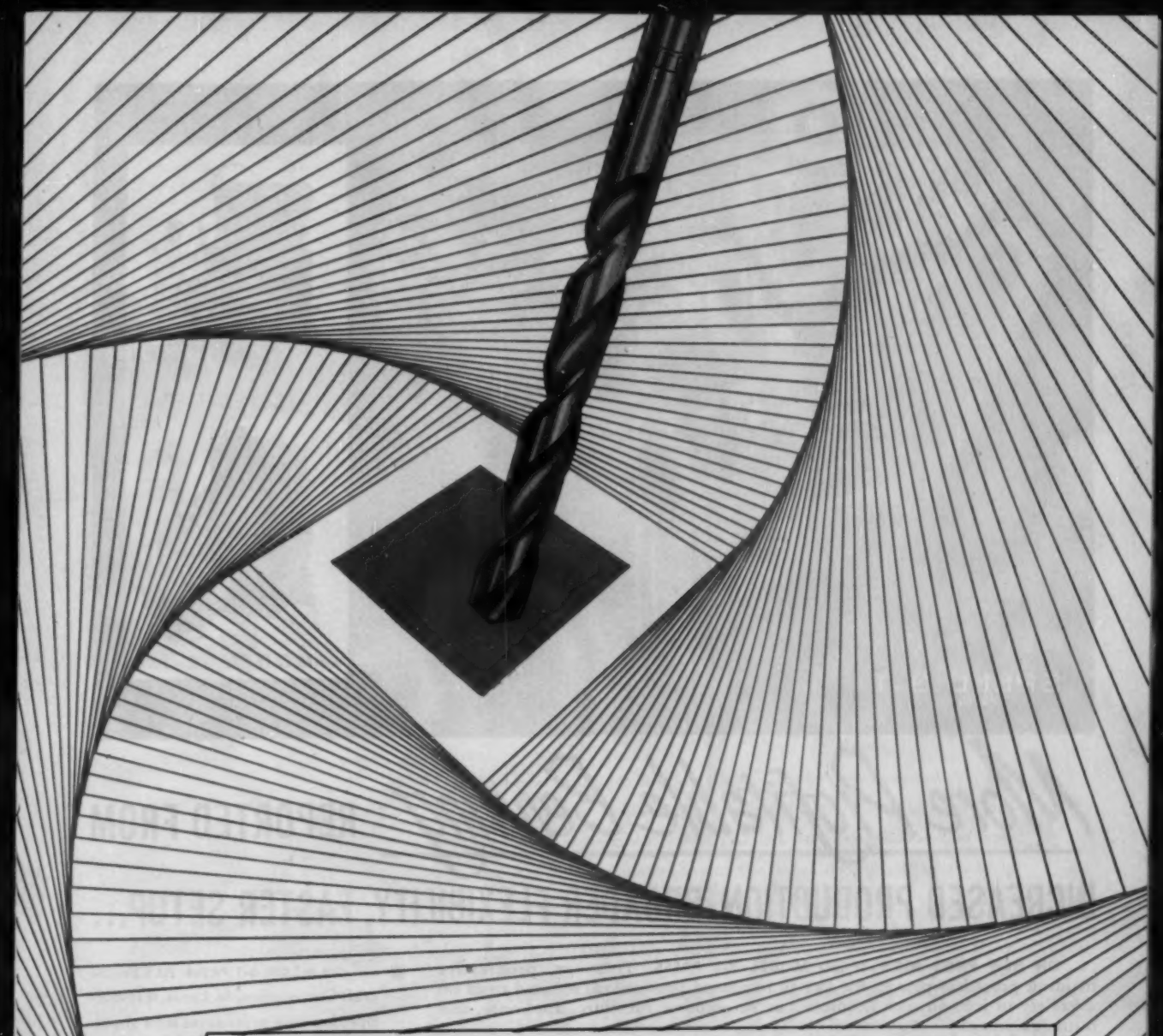
DIVISION OF UNION TWIST DRILL COMPANY

Serving you through the best distributors from coast to coast

CIRCLE 741 READER SERVICE CARD



GEOMETRIC PROGRESSION SYMBOLIZES PRECISE DUPLICATION

CALCULATED TO CUT COSTS

Every UNION cutting tool is an exact geometric duplication of every other of the same size and type. This precise duplication of UNION drills assures consistently high production, reduces drill consumption and costly rejects. For best results, specify UNION drills, reamers, milling cutters, end mills, gear cutters, hobs, carbide tools, and inserted blade cutters. Available nationally through UNION Distributors and stocked in UNION warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City, San Francisco.

UTD

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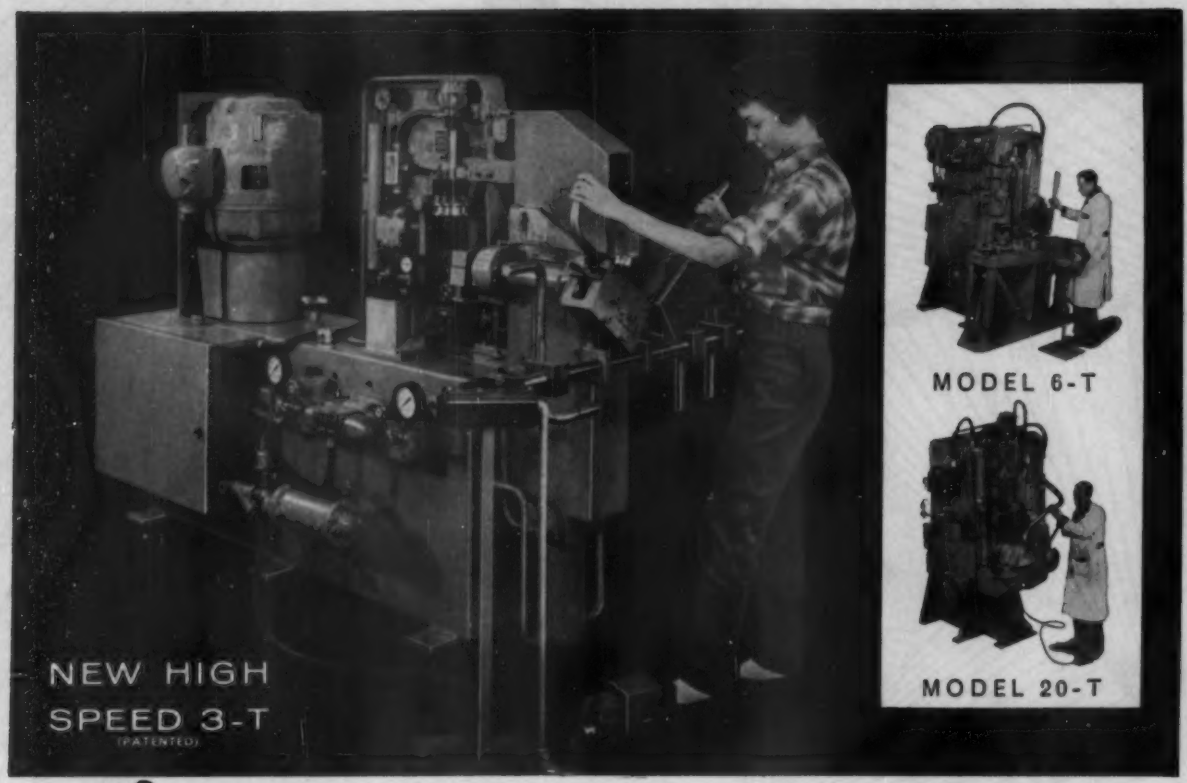
CIRCLE 742 READER SERVICE CARD



More Profitable Bending REPORTED FROM

INCREASED PRODUCTION, BROADER FLEXIBILITY, FASTER SETUP...

. . . ON NEW PINES HIGH SPEED MODEL 3-T PRESS. This new progressive bending press has proven the key to increased production, reduced costs on a variety of jobs in such industries as automotive, furniture, appliance, and farm equipment.

"INCREASED PRODUCTION" . . . reported by Bunting Co., Inc., Philadelphia. Accurate, quality bends are produced on the 3-T three times faster than by conventional methods. Speeds up to 1500 bends an hour on tubular parts up to 1" O.D.

"BROADER FLEXIBILITY" . . . says Kalamazoo Furniture Company, Kalamazoo, Michigan. Wide open tooling area permits rapid progressive bending in varied planes. Up to 10 different bend angles are automatically produced in a single setup with maintained plus or minus ½ degree accuracy.

"FASTER SETUP" . . . reported by Configured Tube Products, Bellwood, Illinois. Pick-out pins in indexing turret permit quick bend angle selection, are easily stored with stop gauges for repeat work. Quick change tooling contributes to fast, 15 minute setups.

- **. . . ON MODEL 6-T PRESS.** At Chromcraft Corporation, St. Louis, this multiple bending press saves time simultaneously forming "U" frames in two and three tubes per cycle at speeds up to 2000 bends an hour.
- **. . . ON MODEL 20-T PRESS.** At The AP Parts Corporation, Toledo, progressive bending of tubes up to 2" O.D. has increased efficiency 20% with speeds up to 800 bends an hour and near elimination of pass-along work-handling.

Get the complete profit story today. Write for New Catalog 379 on Pines Bending Presses

PINES ENGINEERING CO., INC.

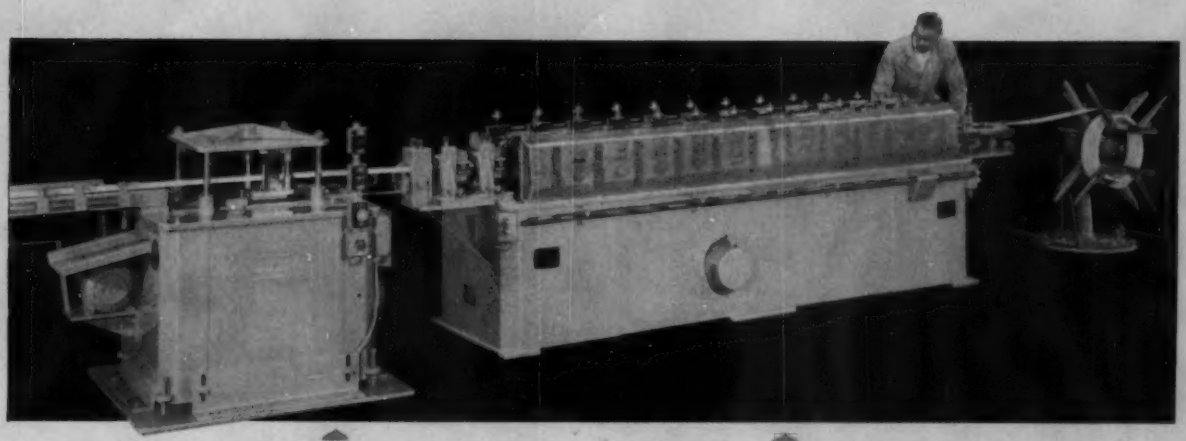
Specialists in Tube Fabricating Machinery

671 WALNUT • AURORA, ILLINOIS

SEE US AT BOOTH 266-68
PRODUCTION ENGINEERING SHOW
SEPT. 6-16 1960
NAVY PIER, CHICAGO

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

new MAPLEWOOD ROLL-FORMING and CUT-OFF *speeds output-cuts costs*



NO. 2 HIGH-SPEED CUT-OFF MACHINE

MODEL N-MR-12 LOCK-SEAM TUBING MILL

This typical production line forms lock-seam tubing in desired lengths, producing at 80 fpm. Prepainted or vinyl-coated .032 aluminum enters the tube mill and is progressively formed into lock-seam tubing. Tube then goes through straightener attachments and tube puller, prior to entering the flying cut-off press where it is automatically cut to length.

designed specially for continuous, heavy duty, high production

This new line of high production, heavy duty machinery will be demonstrated for the first time at the Machine Tool Exhibition of 1960.

Designed for heavy duty continuous production at high speeds of lock-seam tubing, accoustical ceiling sections, aluminum window screen sections, drawer slides, aluminum siding and a variety of other sections, this equipment may be operated in battery of units by a single operator, producing finished sections at rates up to 120 fpm. The flying cut-off press cuts sections to extreme accuracy.

MMT-PE

Be Sure To See These Machines in operation
At BOOTH 1001, Machine Tool Exhibition of 1960.

MAPLEWOOD RMF ROLL FORMING MACHINES

DIVISION OF ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET ROCKFORD, ILL.

COMPLETE LINE OF ROLL FORMING AND SHEET METAL EQUIPMENT

How well are you investing

Hundreds of these machines are now in production service, proving the design and efficiency needed for competitive production. Real production efficiency results from low initial cost, high performance rating, and minimum maintenance required.

metalworking dollars?

FOR WIDE-RANGE FLEXIBILITY—

MODEL OGN
SHAPER-PLANER
with h_3 Drive

ONE MACHINE PROVIDES 3 DISTINCT CUTTING RANGES

for
optimum efficiency

low range to 100 fpm . . . for extreme depth of cut and maximum feeds, with high-speed steel tools.

medium range to 150 fpm . . . for average cuts in medium steel and cast-iron.

high range to 300 fpm . . . for carbide planing of steel and non-ferrous metals.

Exclusive with Rockford h_3 Hydraulic Drive

Analyze your metalworking capital expenditures, and then see these advantages demonstrated at:

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MODERN MACHINE TOOLS MMT-PE PRODUCTION EFFICIENCY

CIRCLE 746 READER SERVICE CARD

RIVETT

– introduced earlier this year
– the first in the

SIXTY SERIES

the precision

SPEED LATHE

now meet the second member of the SIXTY SERIES –

THE PRECISION

TURRET LATHE

featuring "one motion control"

1 Single lever starts lathe spindle and selects any speed within the range up to 4800 r.p.m. Same lever will change speed during operation, instantly stop or reverse spindle and control air operated collet closer. No waiting during speed selection or speed change. Stops may be set for repeating selected speeds on duplicate work.

Stay ahead in the 60's with

RIVETT

CIRCLE 747 READER SERVICE CARD

Greater flexibility of control plus a precision known only to the toolroom makes this all new machine a gem of precision efficiency.

and 4 other Rivett "firsts" for greater accuracy and more productivity on initial machining and second operations

2 **NEW AUTOMATIC INDEXING TURRET** with hardened steel slides. Turret head supported by large, rigid tapered roller bearings. Takes ¾" dia. tool shanks standard or 1" special. Index locking pin mounts on preloaded roller bearings. Turret slide passes over top of double tool cross slide and can be adjusted for vertical and horizontal alignment to spindle.

3 **SPINDLE WITH TRUE ROUNDNESS AND RIGIDITY.** Large diameter super-precision ball bearings fitted to in-line ground mountings. Constant bearing preload holds spindle rigid against both side and end pressure of cutting tool. Unusually heavy wall and wide bearing spacing contribute to rigidity.

Endless vee belts replaced without disassembling spindle. Style 7R stationary collet, 15/16" cap., for bar stock. Style 6R Draw-in collet, 1⅜" cap., and step chucks up to 6" for second operations.

4 **NEW BED FORM FEATURES DOUBLE-BEVEL AND DOVETAIL.** Double-Bevel positively centers turret in alignment with headstock and the large bearing area prevents below-center wear. Dovetail aligns double tool cross slide and evenly distributes its bearing on top of bedway as tool pressure pulls against inverted dovetail.

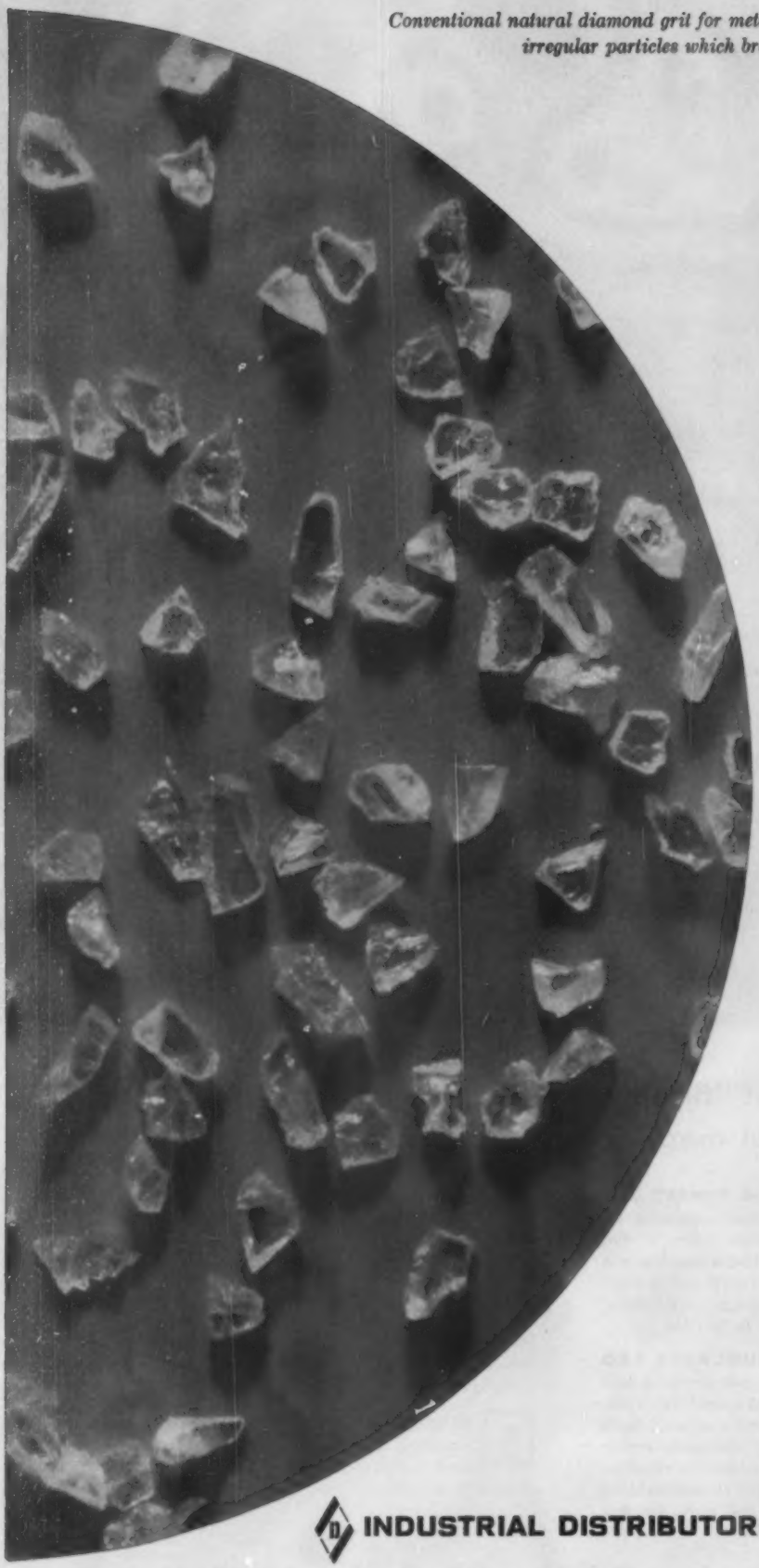
5 **DISTORTION-FREE MOUNTING.** Uneven or non-rigid floor cannot distort lathe. Bed has three-point mounting on a steel channel isolated from any distortion of cabinet.

Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Massachusetts

SEE HOW RIVETT MACHINES SAVE TIME AND MONEY—BOOTH 1210, MACHINE TOOL EXPOSITION, 1960

CIRCLE 748 READER SERVICE CARD

Conventional natural diamond grit for metal-bond wheels and saws. Note the friable irregular particles which break down under heavy pressure grinding



ANNOUNCEMENT:

NEW

NATURAL

DIAMOND GRIT

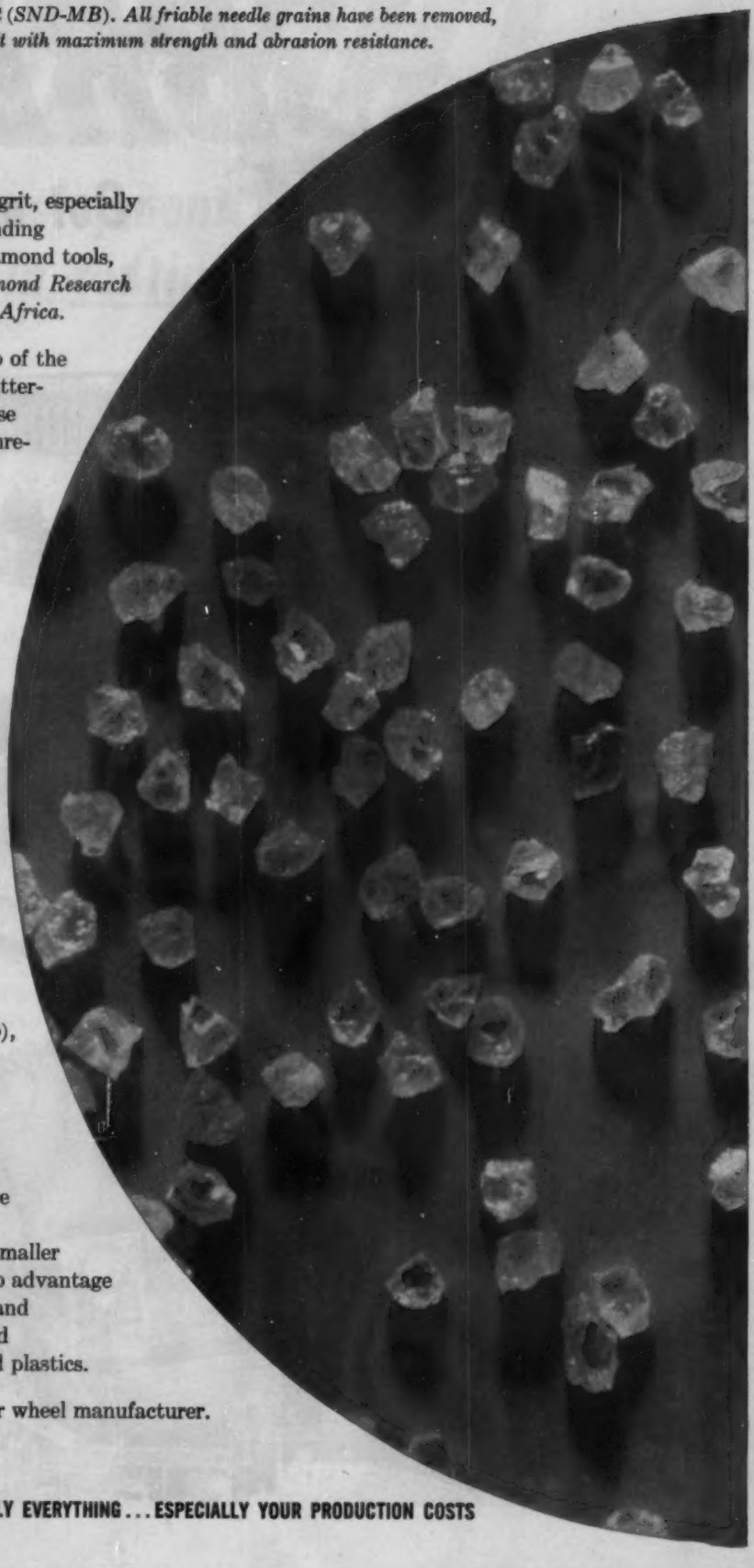
FOR

METAL-BOND

WHEELS

INDUSTRIAL DISTRIBUTORS (SALES), LTD., *London*

New Selected Natural Diamond Grit (SND-MB). All friable needle grains have been removed, leaving only the blocky, cube-like grit with maximum strength and abrasion resistance.



A new type of natural diamond grit, especially suited for use in metal-bond grinding wheels and other metal-bond diamond tools, has been developed at the *Diamond Research Laboratory, Johannesburg, South Africa.*

This new natural grit is made up of the strongest, most abrasion and shatter-resistant diamond particles for use in metal matrixes. A new pressure-testing and selecting process removes friable particles from the grit. Thus, the inherent strength of the natural diamond particle is ideally presented for the heavy-duty cutting done with metal-bond wheels and saws.

The new grit has been found stronger than any diamond grit available to date. In tests with concrete, marble, and tile, the new grit permitted a 30 to 50 per cent faster cutting rate than was previously possible. Further tests are under way in actual production set-ups.

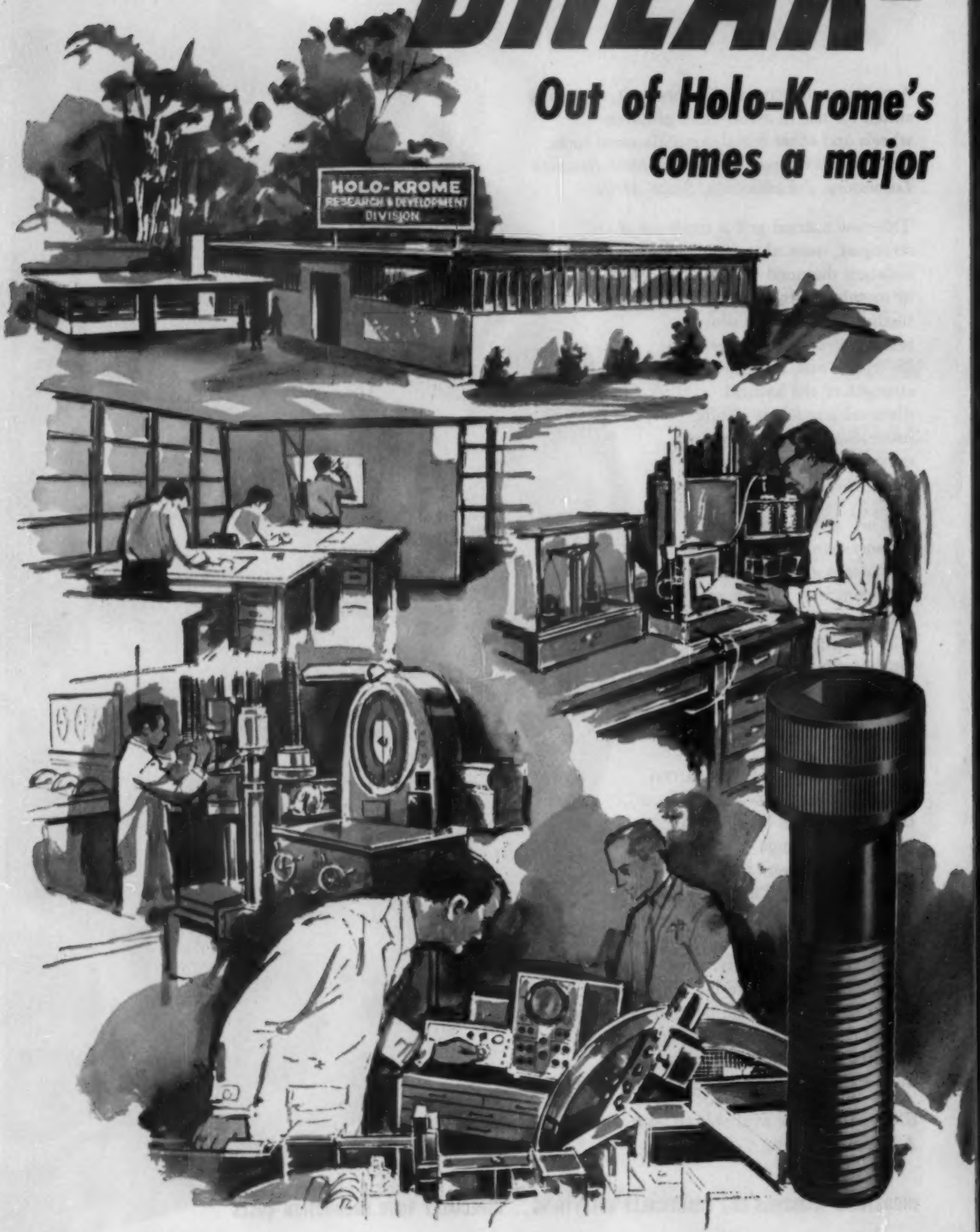
Known as SND-MB (SELECTED NATURAL DIAMOND-METAL BOND), the new grit will be offered in a production range of mesh sizes from Tyler screen 16 to 325 mesh at present. The larger sizes will be used in metal-bond saws and thin-wall core drills, which are used in cutting concrete, stone and other rugged materials. The smaller cube-like diamonds will be used to advantage in metal-bond wheels for cutting and grinding of materials like glass and ultra-hard ceramics and reinforced plastics.

SND-MB is now available to your wheel manufacturer. Ask him about it.

INDUSTRIAL DIAMONDS CUT PRACTICALLY EVERYTHING... ESPECIALLY YOUR PRODUCTION COSTS

BREAK-

Out of Holo-Krome's comes a major



THROUGH!...

Research & Development Division break-through in continuous warm forming...

*Thermo-Forged SOCKET SCREWS

The most dramatic innovation in socket screw manufacture in 28 years!

NOW, at last, after years of intensive research, Holo-Krome breaks the warm forming barrier with its revolutionary new electronic THERMO-FORGED process.

The first major break-through in socket screw manufacture since Holo-Krome pioneered and patented *Fibro-Forging* 28 years ago, Holo-Krome's unique new THERMO-FORGED process is *the first continuous, high-speed warm forming technique to be perfected!*

This revolutionary process *pre-conditions* the metal in patented apparatus for near-perfect forging conditions—by creating *just-the-right ductility* for the precise flowing of metals.

It gives Holo-Krome complete and continuous control and mastery over heat—and at unusually high speeds!

New and far higher standards in quality, precision and uniformity are now attained with Holo-Krome's exclusive THERMO-FORGED process. This unique process produces socket screws near-perfect in structure and of a uniform accuracy and quality never before possible!

Thoroughly researched in the laboratory and field-tested for more than two years, Holo-Krome's THERMO-FORGED Socket Screws are now available to industry through H-K's nationwide corps of authorized industrial distributors.

HOLO-KROME
*Thermo-Forged**
SOCKET SCREWS

SOLD ONLY THROUGH AUTHORIZED HOLO-KROME DISTRIBUTORS
THE HOLO-KROME SCREW CORPORATION • HARTFORD 10, CONN.

*Trade Mark of The Holo-Krome Screw Corp.

With the A-L Steelector System

How can you pick the right tool steel when there are more than 1000 brands, each jostling for your attention? And how can you pick a tool steel and know before you order that the grade you want is available—without delays—in the size and shape you need?

If you are tired of wrestling with these problems you will like the new Allegheny Ludlum Tool Steel STEELECTOR Program. With it you can accurately select a tool steel that will meet your requirements and be sure that you have picked a grade that is in stock . . . as near as your warehouse source.

It's easy to make accurate selections with the STEELECTOR Program. The three STEELECTOR cards—covering general purpose tool steel applications, hot work applications, and high speed grades—show at a glance the comparative properties of tool steel grades that will suit 96% of all tool steel applications listed in the A-L Tool Steel Handbook.

The STEELECTOR cards use bar graphs to make it easy to make precise comparisons of abrasion resistance, toughness, size stability, machinability, and red hardness. All you have to do is pick the grade with the particular combination of properties you need for the job at hand.

For each grade, there is a Data Stock List that tells you the exact analysis of the grade, its basic properties, typical applications and their working hardnesses, and temperatures for hardening, tempering, and annealing. And the complete range of available sizes and shapes is listed.

You can count on getting quality tool steel by using the STEELECTOR Program. Each STEELECTOR grade has been selected from the complete line of Allegheny Ludlum Tool Steel and made under the exacting quality control standards of all A-L products.

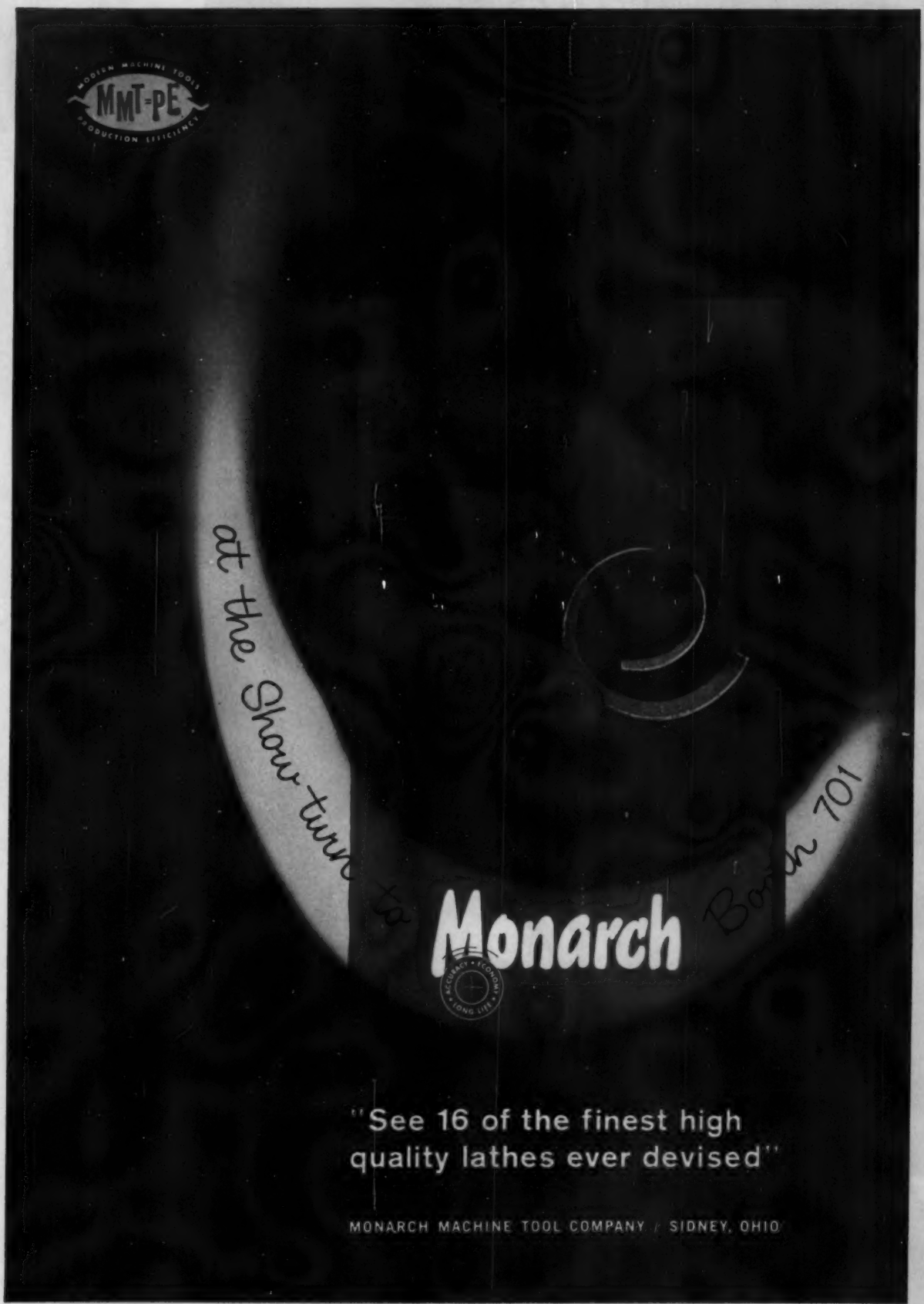
The new A-L Tool Steel STEELECTOR booklet contains the STEELECTOR Cards, descriptions of the various grades, and explains the individual Data Stock Lists available for every grade. For your own copy ask your Allegheny Ludlum sales representative, or write: *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. AM-8-2*

STEELECTOR PROGRAM

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

2084


MMT-PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY
at the Show turn to Booth 701
Monarch
ACCURACY • ECONOMY • LONG LIFE
"See 16 of the finest high quality lathes ever devised"
MONARCH MACHINE TOOL COMPANY / SIDNEY, OHIO

FEDERAL
JEWELED
DIMENSIONAIR
FEDERAL PRODUCTS CORPORATION
PROVIDENCE, R.I. U.S.A.
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FEDERAL
FEDERAL
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MASTER
1.0000 X X

NO

DOUBT ABOUT IT

. . . that's why the

DIMENSIONAIR

is the best air gage you can buy!

No doubt about the Dimensionair's readings

Such sharply defined calibration — the mark of a truly accurate gage — obviously gives you greater resolution, much finer readings than broadly defined graduations and wide hands or air-suspended markers ever can. Each time you gage with the Dimensionair, the needle-thin indicating hand advances smoothly, comes to a positive stop, yet is responsive to the slightest change. Its position in relation to the fine-line graduations is unmistakable. Such decisiveness, coupled with Dimensionair sensitivity, means much greater readability. In fact, tests prove that you get more information from the Dimensionair than from other air gages having *twice* the magnification.

No doubt that the Dimensionair maintains its accuracy

Dimensionair magnification is built-in . . . fixed. No adjustment can change it. That's why the Dimensionair, once set, *stays* set. Air pressure variations cannot affect the accuracy of the Dimensionair. Its balanced air circuit cancels them out, This achieves a stability which cannot be approached by other air gages.

No doubt the Dimensionair is easiest to use

Its fixed magnification and protection against drift guarantees *linear, calibrated* accuracy so you need only *one* master for set up . . . make only *one* adjustment to set zero. You're ready to gage in less than ten seconds! Dimensionair design gives you wide range operation (up to .006" depending on model selected)*. You also get greater plug clearance and more deeply recessed gaging jets for faster, easier gaging and longer life than is possible with other air gages.

All these advantages are based on the fact that the Dimensionair, unlike other air gages, is *built* to a specific accuracy and magnification. This is an important difference, as thousands of Dimensionair users can tell you. But don't just take our word for it . . . see for yourself. We will be glad to demonstrate the Dimensionair to you, either by itself or against any other air gage. We have offices all over the country. There's a Dimensionair near you, ready to be demonstrated.

FEDERAL PRODUCTS CORPORATION
6128 Eddy Street · Providence 1, R. I.

*FIVE MAGNIFICATIONS TO CHOOSE FROM:
1,250:1 (.006" range, each grad. = .0001")
2,500:1 (.003" range, each grad. = .00005")
5,000:1 (.0015" range, each grad. = .00002")
10,000:1 (.0006" range, each grad. = .00001")
20,000:1 (.0003" range, each grad. = .000005")

Yours for the asking!
"DIMENSIONAL GAGING WITH AIR"

A truly educational film — 16 mm, 40 minute, color — outlines the basic principles of air gaging — shows applications. Surely a must for engineers who must apply air gaging, or for anyone who is responsible for dimensional control. Puts the value of air gaging in the proper perspective. Write for reservation.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

"The No. 3's split the tenths!"

So report users of Moore's New Jig Borer and Jig Grinder

You will easily break the "tenth" barrier with this accurate machine. No gibs...no overhang...improved drive ...speed range of 60 to 2250 RPM...11 x 24" table working surface. It bores, drills, reams and spots holes in dies, jigs and production parts with unequalled speed and accuracy.

With this new, larger No. 3 model, you can grind—*with split-tenth* accuracy—holes plus regular and irregular contours to size and location after hardening. Faster strokes are provided for chop-grinding... infinite spindle speeds, 40 to 250 RPM...larger table working surface, 11 x 24".

All hardened, ground and lapped ways. Made and calibrated to the new international inch.

Write today for literature describing the many advantages of the No. 3 Moore Jig Borers and Jig Grinders.

MOORE SPECIAL TOOL COMPANY, INC.
300 Union Avenue, Bridgeport 7, Conn.

"Our operators feel that these are the best machines they have ever worked on. They take care of the tenth-splitting tolerances required by industry today. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines." These are the words of Herbert Harig, President (left above), and Karl Harig, Chairman (at right), Harig Manufacturing Corporation, Chicago, Illinois.

Among the highly skilled toolroom operators in the Federal Products Corporation, Providence, Rhode Island, is this talented jig grinder operator, Mrs. Florence Smith. Mrs. Smith achieves ultra-precise results with the No. 3 Moore Jig Grinder.

"We have found that it costs real dollars and cents to operate without Moore equipment. This cost factor is just one of many reasons why we recently added the new Moore Model No. 3 Jig Grinder. This Machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better." Statement by Val Koller, President, Koller Die & Tool Co., Milwaukee, Wisconsin.

HOLES, CONTOURS AND SURFACES. Moore's authoritative book, tells how to produce tools, dies and precision parts the modern way. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

Van Norman

FOR PERFORMANCE • ACCURACY • ECONOMY

in all machining operations

Machine Engineering at Its Best!

Van Norman offers industry the machines it needs for greater production, greater precision and greater savings. This is possible through Van Norman "Industry-Integrated Design"—which assures the production benefits most-wanted on the particular job through skillful selection and coordination of components.

All-New Van Norman Model 1M Lectro-Cam Miniature Bearing Grinder

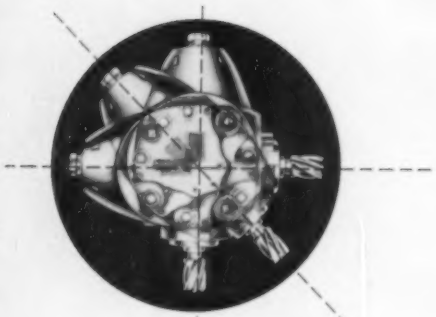
...fully-functional design gives the precision control long-needed in miniaturization operations. Van Norman Model 1M is an all-new Plunge-Cut Radius Grinder of ball grooves on inner races of miniature bearings. It is engineered for high production, rapid set-up, stability, and simple, low-cost maintenance.

Chief Features and Specifications:

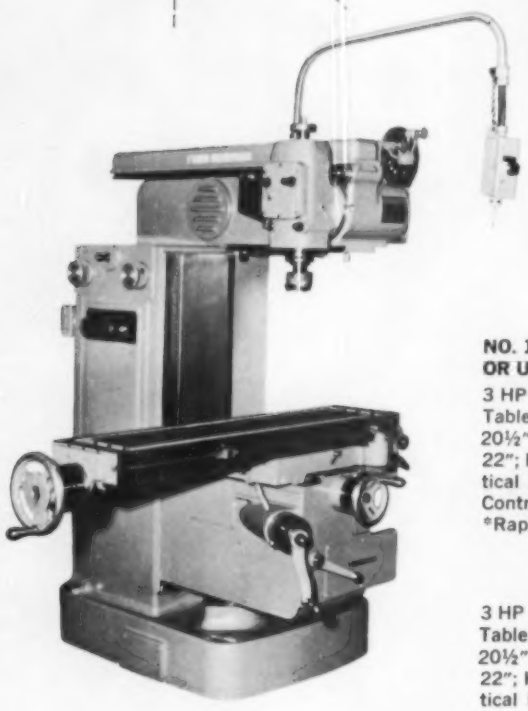
- Precision Radius Dresser with Wheel Side Dressing
- Automatic Size Compensation
- Anti-friction Precision Spindles
- Compact! 52" w. x 42" d. x 87" h. including Coolant Tank and Control Panel
- Grinding Wheels: 14" dia. x 5" I. D.
- Auto-Cycle Infeed .100" Total Slide Movement
- Work range: 0½" dia. — 0¾" wide
- "Lectro-Cam" Programmed Feed
- Simplified Tooling

VN

Increase Production Van Norman



Horizontal, Angular or Vertical Milling are at your finger-tips with ONE Van Norman Ram-Type Miller. Versatility and Range Pay Off in Performance



A single investment in one Van Norman Ram-Type Milling Machine gives you the equivalent of two separate millers plus attachments at the much lower cost of a single machine. Not only do you save machine dollars, but with a Van Norman you get increased production with substantial savings in milling costs.

14 new standard models — cutterhead motors from 3 to 10 HP (*15 HP optional)—table sizes from 42½" x 10" to 64" x 14" (*72" x 16" optional). You thus have a wide range of selection to fit your needs most exactly. Write for individual catalogs giving complete information. Mail to: Van Norman Machine Company, Springfield 7, Massachusetts.

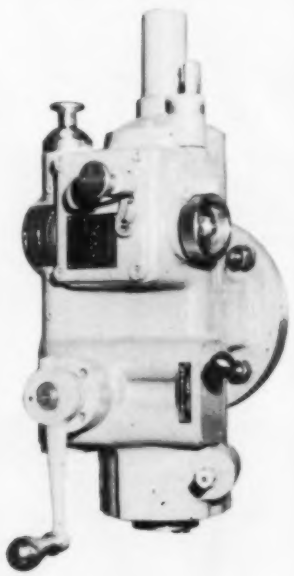
NO. 1R (22-3)—PLAIN OR UNIVERSAL

3 HP Cutterhead Motor; Size of Table, 42½" x 10"; Ram Travel 20½"; Power Longitudinal Feed 22"; Hand Cross Feed 10"; Vertical Hand Feed 24"; Pendant Control.
*Rapid Traverse Knee Elevating

NO. 1RQ (22-3)—PLAIN OR UNIVERSAL

3 HP Cutterhead Motor; Size of Table, 42½" x 10"; Ram Travel, 20½"; Power Longitudinal Feed 22"; Hand Cross Feed 10"; Vertical Hand Feed 24"; Pendant Control; 4" Quill Travel; 3 Power Feeds (.0015" - .003" and .006" feed per revolution).
*Rapid Traverse Knee Elevating

*Optional Equipment



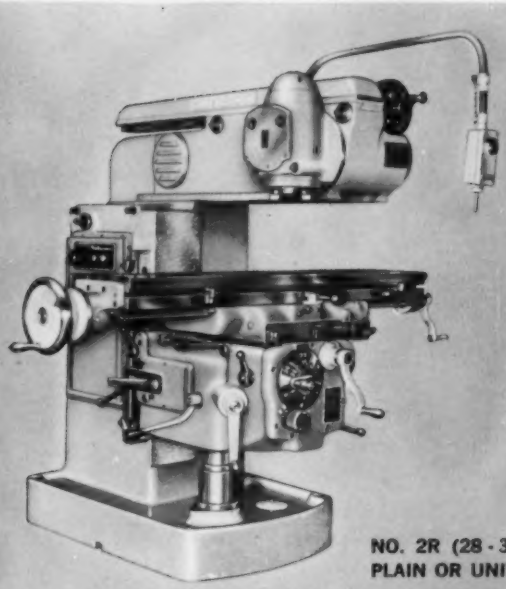
FOR YOUR CONVENIENCE...

NEW NUMBER DESIGNATIONS FOR VAN NORMAN MACHINES

1	R	Q	22	3
Class	Ram Type	Quill Spindle	Table Travel	Spindle HP

All industry is talking about the new Van Norman

Efficiency with Ram-Type Millers

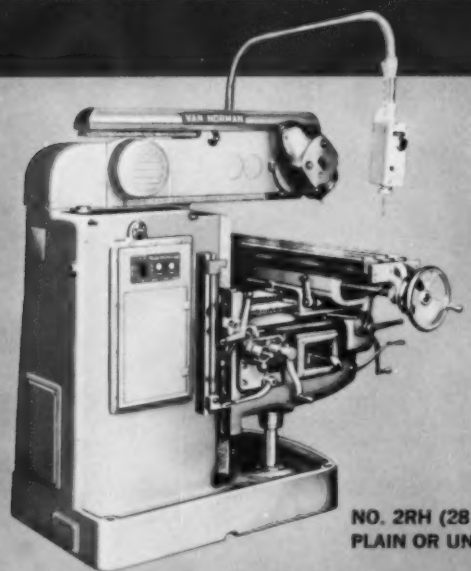


NO. 2R (28 - 3)—
PLAIN OR UNIVERSAL

3 HP Cutterhead Motor. Size of Table: 50" x 10½". Ram Travel: 29". Power Longitudinal Feed 28". Power Cross Feed 12". Power Vertical Feed 18". Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls.

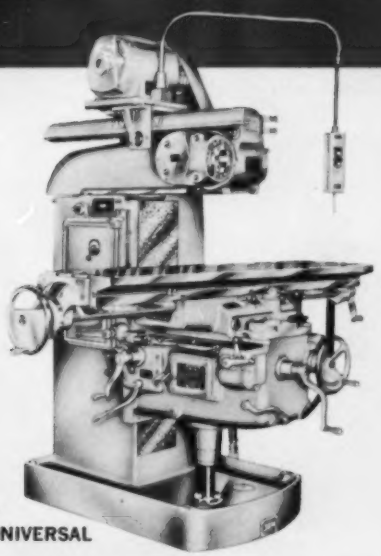
NO. 2R (28 - 5)—
PLAIN OR UNIVERSAL

5 HP Cutterhead Motor. Size of Table: 50" x 12". Ram Travel 25". Power Longitudinal Feed 28". Power Cross Feed 12". Power Vertical Feed 20". Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls.



NO. 2RH (28 - 7½)—
PLAIN OR UNIVERSAL

7½ HP Cutterhead Motor. Size of Table: 58" x 13". Ram Travel 29". Power Longitudinal Feed 28". Power Cross Feed 14". Power Vertical Feed 20". Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls.

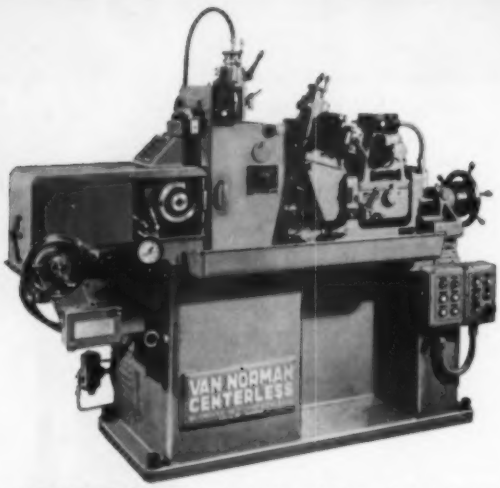


NO. 38MA—
PLAIN OR UNIVERSAL

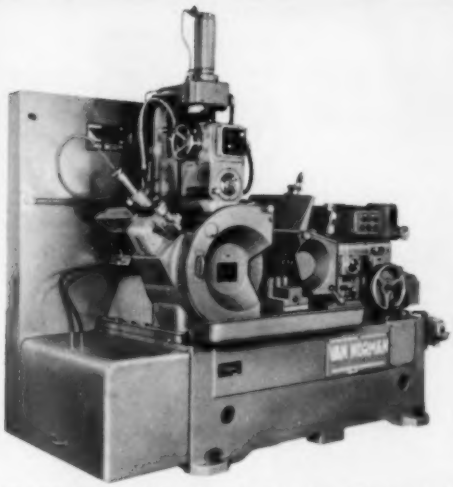
10 HP Cutterhead Motor. Size of Table: 64" x 14". Ram Travel 29". Power Longitudinal Feed 35". Power Cross Feed 14". Power Vertical Feed 21¼"; Rapid Traverse (6 Directions); Pendant Control; Front and Rear Hand Controls Automatic Backlash Eliminator with Plain Saddle.

Van Norman Production Grinders

BOOST PRODUCTION · HOLD CLOSE TOLERANCES
GIVE EXTRA-FINE FINISHES · MINIMIZE COSTS

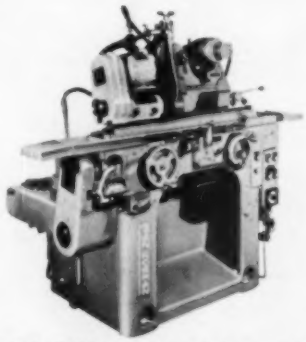


No. 1C CENTERLESS—Grinds wide variety of small parts—whether straight-formed, multi-diameter, or with special contours. Assures fine micro-finishes, close tolerances, and concentricity at high output-rates. Actually three machines in one—handles thru-feed work and infeed jobs with standard diamond dressing, and complicated forms when equipped with Van Norman Crush Dressing Attachment. Work capacity: 0-1½" dia. Grinding wheel and Regulating wheel spindles are unit-construction, anti-friction bearings with sealed lubrication. Grinding wheel diameter 14" x 4" width. Regulating wheel speed ranges infinitely variable 13-80 RPM; 140-830 RPM. Main drive: 7½ HP. Regulating wheel drive: ½ HP. Separate Coolant System.



No. 2C CENTERLESS—Rugged, heavy-duty machine for producing more work per operator per work shift. Precision-built for fast, cost-cutting precision grinding. So versatile it can do the work of three types of centerless grinders with a minimum of changeover time. Does thru-feed work and infeed work with diamond dressers furnished as standard equipment; readily equipped with a Van Norman Crush Dressing Attachment for form grinding and profile work. Work capacity 0-4¾" dia. Heavy-duty unit-type grinding wheel spindle, with 15 HP drive motor. Infinitely variable regulating wheel drive. Fine hand-wheel adjustment on diameter of work piece.

See this Machine in Operation at the
MACHINE TOOL BUILDERS' EXPOSITION
Chicago International Amphitheater
September 6-16
BOOTH NO. 351



No. 418 CYLINDRICAL—For high-speed precision cylindrical grinding. Engineered for versatility, accuracy, economy and operator convenience. Plunge or traverse grinding; diamond or crush wheel dressing; manual or automatic infeed control. Unit-type *anti-friction* spindle. Wheelhead retraction .250" or .850"; 14" O.D. x 5" I.D. wheel up to 2" wide; maximum swing 4-3/16". Maximum distance between work centers 18". Wheelhead motor 3 HP; headstock motor ¼ HP; feed motor ½ HP.

VAN NORMAN MACHINE COMPANY
DIVISION OF VAN NORMAN INDUSTRIES, INC.
SPRINGFIELD 7, MASSACHUSETTS, U. S. A.

THE **NEW**

HARDINGE
ELMIRA, N.Y.

HARDINGE HIGH SPEED TOOL ROOM LATHE

MODEL HLV-H

FEATURES:

- NEW FULL BEARING TAILSTOCK
- NEW PRELOADED BALL BEARING HEADSTOCK
- NEW ELECTRIC INTERLOCK FOR SPINDLE LOCK PIN
- NEW WIDER FULL BEARING HARDENED AND GROUND DOVETAIL BEDWAYS

WRITE FOR FREE BULLETIN

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

Bearings, Inc. recommended a better seal, a better bearing and savings are $700.00 a year!

Here's a maintenance foreman who knew where to get help when bearings in his care failed prematurely. He called a Bearings, Inc. engineer when the bearings in this bucket elevator conveyor failed after only two weeks of use.

The Bearings, Inc. engineer found that the powdered zinc transmitted by the conveyor was responsible for the failure. Powdered zinc had worked through the bearing seal and since zinc joins itself when rubbed between two surfaces, being rubbed between the balls and bearing race led to a build-up that stopped the bearings in their tracks.

Analysis of loads and speeds showed a less expensive bearing would work well if its seal would shut out all dirt. The original bearings cost $16.79 each — the replacement only $7.36! This meant a net saving of $700 in bearing costs alone. Now in operation for two years the bearings have been replaced only once.

Bearings, Inc. sales engineers sell only products we are authorized to sell. No deals, no "just as good as" substitutes. Call the branch nearest you — The bearings you want are in stock ready for delivery.

Providing bearing service in the North ➤ **BEARINGS, INC.**

DELAWARE: Wilmington • **ILLINOIS:** Neiman Bearings Co., E. St. Louis • **INDIANA:** Ft. Wayne • Indianapolis • Muncie • Terre Haute • **MARYLAND:** Baltimore • **MISSOURI:** Neiman Bearings Co., St. Louis • **NEW JERSEY:** Camden • Newark • **NEW YORK:** Bolanrol Corp., Buffalo • Niagara Falls • **OHIO:** Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Painesville • Toledo • Youngstown • Zanesville • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York • **WEST VIRGINIA:** Charleston • Huntington • Parkersburg • Wheeling

and

in the South ➤ **DIXIE BEARINGS, INC.**

ARKANSAS: Little Rock • **FLORIDA:** Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge New Orleans • **N. CAROLINA:** Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville Memphis • Nashville • **VIRGINIA:** Norfolk • Richmond • Roanoke

THE NEW

HARDINGE
ELMIRA, N.Y.

HARDINGE HIGH SPEED PRECISION LATHE

MODEL DV59

FEATURES:

- NEW FULL BEARING TAILSTOCK
- NEW PRELOADED BALL BEARING HEADSTOCK
- NEW ELECTRIC INTERLOCK FOR SPINDLE LOCK PIN
- NEW COMPOUND SLIDE REST WITH HARDENED AND GROUND STEEL TOOL POST SLIDE

WRITE FOR FREE BULLETIN

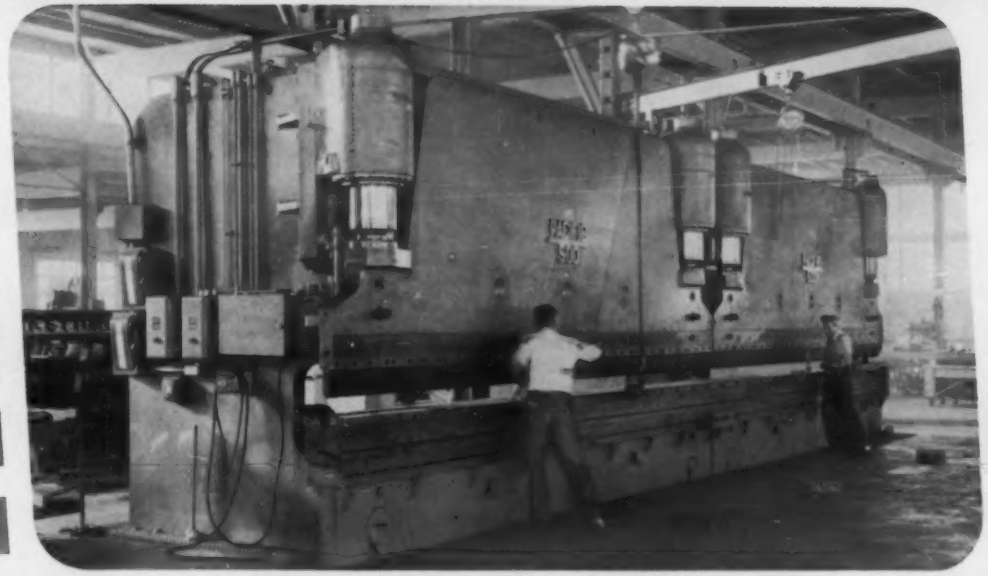
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

15 years engineering and millions of dollars invested* to perfect the world's finest brake... today's PACIFIC HYDRAULIC PRESS BRAKE

Over 9 out of every 10 hydraulic press brakes in operation today are PACIFIC providing...

- More dependability
- Freedom of maintenance and leakage
- Simpler electric controls
- Simpler hydraulic control
- More accuracy in level control
- More accuracy in air bending
- More operating convenience
- Greater visability
- More rigidity in cylinder construction
- Shock-free hydraulic system suitable for punching



TWO 20 FT. BRAKES OPERATE AS ONE to punch and form 40 ft. checker plate in single hit. By purchasing two 500 ton PACIFIC brakes which can operate together as a single 1000 ton brake 40 feet long or as two independent 500 ton machines, each 20 ft. in length, this custom fabricator found the practical means to form tremendously long pieces without an additional investment of tens of thousands of dollars for a single 40 ft. long 1000 ton machine. The company also gets the benefit of double production in forming shorter sections.

*THIS INVESTMENT ENABLED PACIFIC TO INTRODUCE:

- Tape control to synchronize cylinders within .003" (1947)
- Cushioned punching (1949)
- Precision depth control to repeat accuracy within .001" (1951)
- Manual turret stroke controls for progressive bending (1952)
- Selective anti-whip speeds to eliminate reverse bends (1952)
- Tandem operation of press brakes for forming pieces 40 ft. or longer (1953)
- Tonnage control to protect light dies in heavy press (1953)
- Multiple hydraulic cushion cylinders for deep drawing (1954)
- Overhead integral power unit for increased accuracy (1955)
- Cylinder ram guides for increased rigidity (1956)
- Shearing attachment for shearing heavy plate on press brake (1958)
- Pipeless stacking of valves to eliminate pipe breakage and leakage (1959)
- Shockless hydraulic valving to eliminate cause of leakage (1959)

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- NEW PRODUCTION THREADING HEAD
- NEW ELECTRIC PRODUCTION DRIVE
- NEW POWER CROSS FEEDING TURRET
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MODEL HCT-CFR

WRITE FOR FREE BULLETIN

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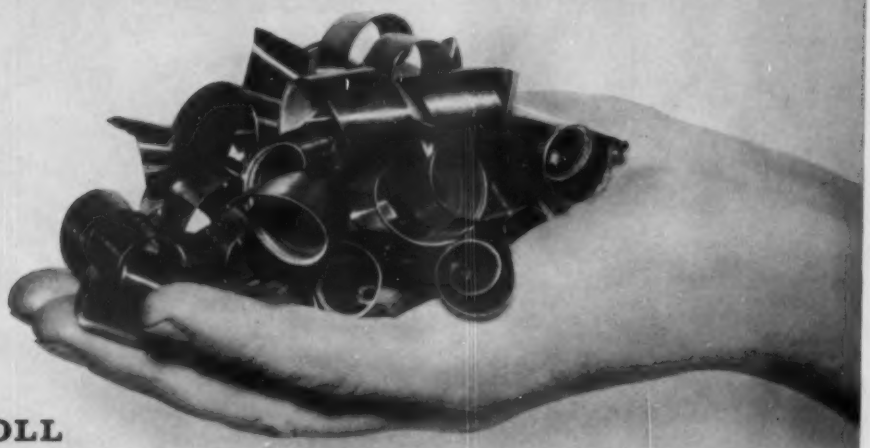
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

Why did these chips

cost more than these?



LOOK TO INGERSOLL FOR THE ANSWER

—because the cutter used to produce the more costly chips was not the right one for the work or for the machine on which it was used. It was a good cutter but not as good as it could have been. It's as simple as that.

The lower cost chips were produced by a cutter recommended by Ingersoll Cutter engineers. Their recommendation was based on an analysis of the work, the job requirements and the machine.

There are many ways that the cost of chips can be reduced. Why not let an Ingersoll representative make a preliminary survey? It will cost you nothing and may lead to important savings. Ask to have a representative call, or write for booklet "Ways to reduce the cost of chips." Address Dept. K-68.

THE INGERSOLL MILLING MACHINE COMPANY CUTTER DIVISION ROCKFORD, ILLINOIS

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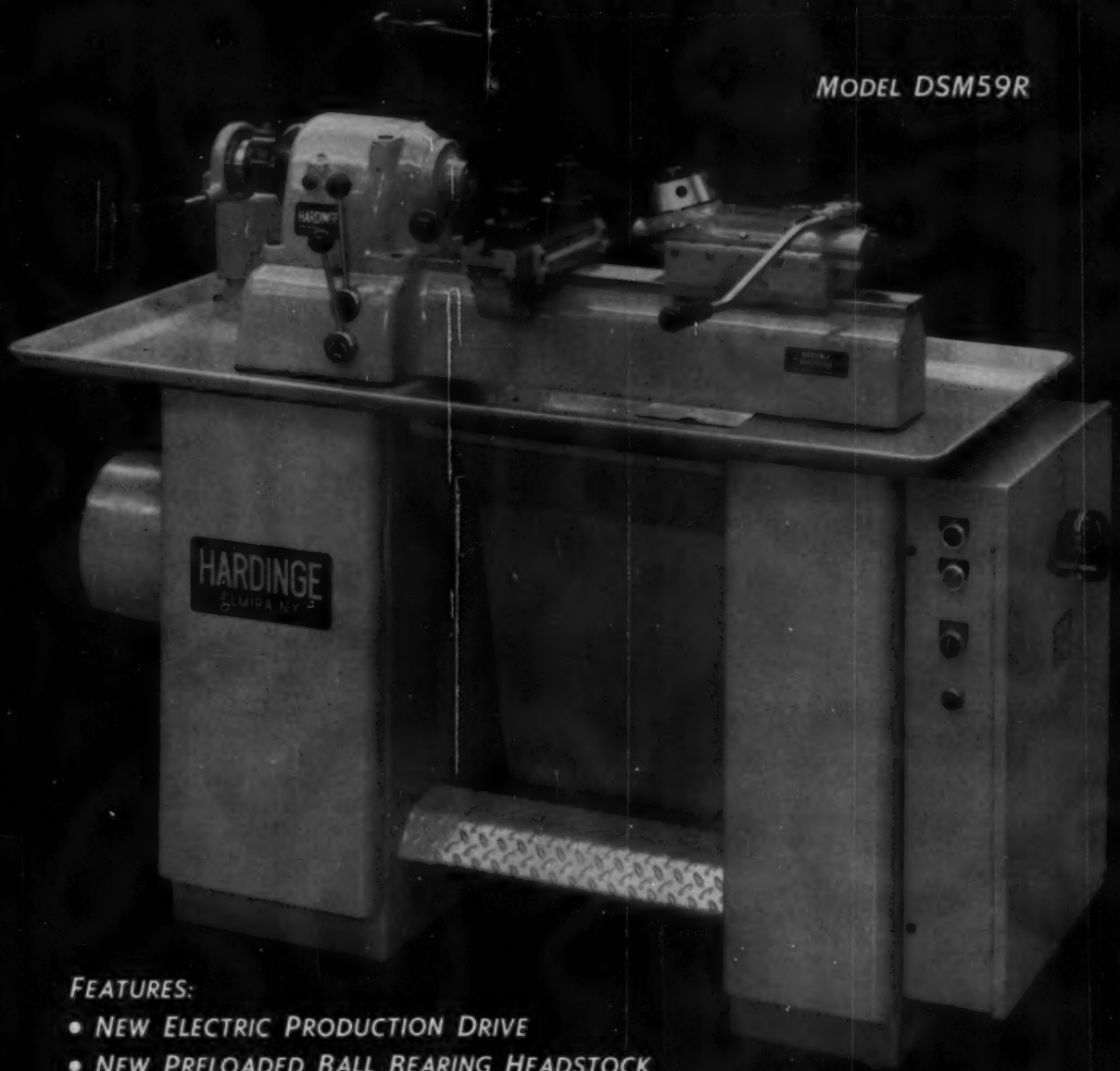
ELMIRA, N.Y.

HARDINGE HIGH SPEED
SECOND OPERATION MACHINE

MODEL DSM59R



FEATURES:

- NEW ELECTRIC PRODUCTION DRIVE
- NEW PRELOADED BALL BEARING HEADSTOCK
- NEW ELECTRIC INTERLOCK FOR SPINDLE LOCK PIN
- NEW COOLANT FACILITIES WITH SELF DRAINING PAN

WRITE FOR FREE BULLETIN

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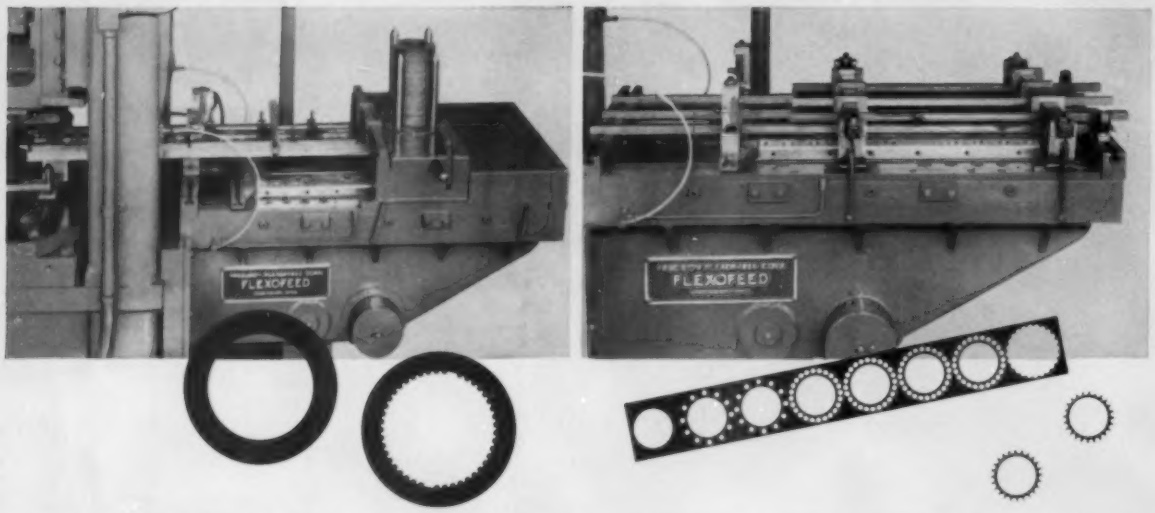
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

PRECISION Quarterly NUMBER 6

PRECISION WELDER AND FLEXOPRESS CORPORATION, 3560 Ibsen, Cincinnati 9, Ohio

Feed Stamps Out Press Idle Time



CINCINNATI – For the first time, a high-productivity press can become a whole stamping department in one machine. The secret is Flexofeed, a remarkably adaptable mechanism that keeps a press busy because it can feed stock from a coil, or blanks from a magazine, with equal accuracy and agility.

The changeover from coil stock to blanks, or vice versa, is fast (sometimes little longer than it takes to change the die), because only the top reciprocating part of the Flexofeed is replaced. The basic structure – frame, gearing, and linkage – remains permanently fixed to the press.

FLEXOPRESS, NATURALLY – Flexofeed was designed to operate hand-in-glove with a Precision Flexopress, for what better way can you get full-time high productivity in your stamping department? The Flexofeed is adjustable for various widths and feed increments within a range that covers most applications of high productivity presses. It maintains absolute control over the stock up to the instant of impact.

Progressive die work and second operations on the same machine? Not only practicable, but profitable if it's a Flexopress equipped with Flexofeed.

PROOF POSITIVE – A large automobile parts manufacturer is stamping clutch plates for automatic transmissions on a 125-ton straight side Precision Flexopress equipped with Flexofeed. The blanks are 5" diameter steel circles, .040" thick. The manufacturer hoped for production of 200 plates a minute and is getting 250.

In a few days he turns out all the clutch plates he can use for a while, so in a couple of hours he shifts to the progressive stamping of bearing spacers from coiled steel stock, also at 250 per minute.

In another couple of hours he can be stamping blanks again. We hesitate to call this a "universal" feed because it sounds like bragging, but you can see that we are tempted. PRECISION

THE WELDER THAT WOBBLES ON PURPOSE

Suppose you want to weld thin walled, 3" diameter tubing to end flanges of the same material – 20 gage aluminized mild steel. Do you call in a brazing expert, or do you decide to punt?

A Michigan manufacturer of space heaters had a better idea. He called in Precision Welder and Flexopress Corp., and discovered an idea ready-jelled to solve his problem.

It's a Wobble-Head Welder (honest). A cup-die, mounted eccentrically on a rotating shaft, literally wobbles around the circumference to be welded, making magnificently clean ring welds from ¾" to 6" in diameter.

Now the Michigan manufacturer is happily welding sheet metal heat exchangers, and if you have flanges to weld to tubes, or tubes to weld to tanks, or some such, you can be happy too with a Precision Wobble Head Welder. Call us about it today.

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Lucas provides

Lever control.

Pendant control

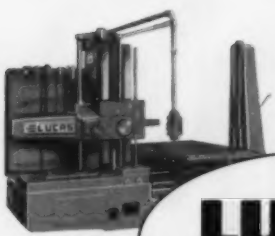
Tape control

and a variety of combinations of the three for flexibility of control suited to the type of work required.

For example . . . The Multiple Control Pendant selects speeds, feeds, unit travels, rapid traverse of head, table, saddle and spindle, plus the rotation of the spindle forward and reverse, jog and stop. Speeds and feeds can be pre-selected while the machine is in operation.

Practical applications of these controls are spelled out in a new catalog. Write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland, Ohio. When you think of flexibility . . .

think of . . .



LUCAS
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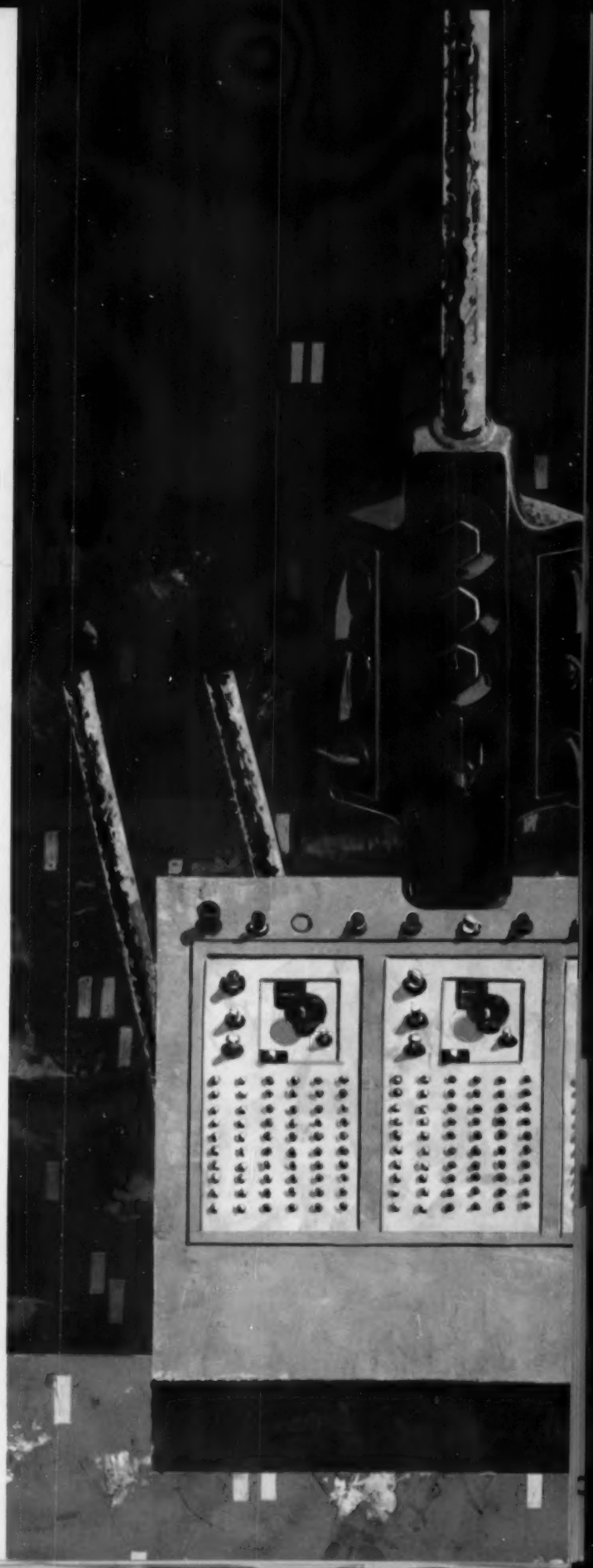

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Lucas feeds the saddle ⇐

Lucas feeds the spindle ⇒

Feeds both in combination ⇒⇐

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Combine these motions with

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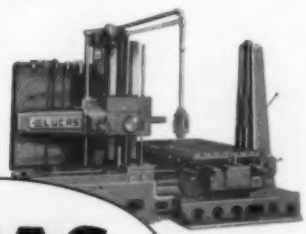

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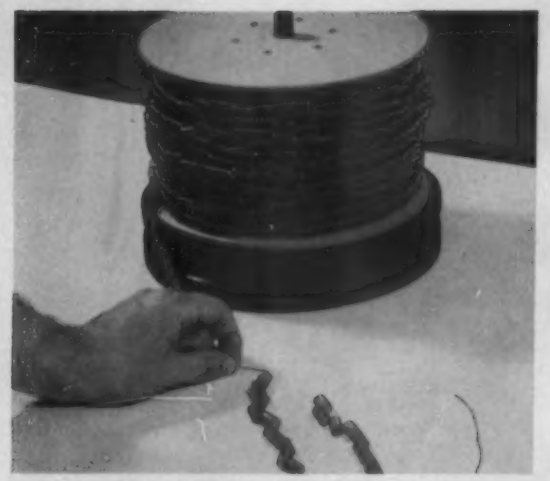

. . . more efficient handling, storing, sorting, orienting, feeding, placing of springs for installation

To production planners, Spring-Flow packaging opens up a world of possibilities for assembling A.S.C.-made springs, small stampings, and wire forms into your products easier and faster. It solves many problems caused by intricate shapes, tangling, loss by spoilage; maintains critical tolerances, uniform quality; simplifies inventory control and storage.

To learn how Spring-Flow may solve your problem, contact the nearest A.S.C. Division, or write for Spring-Flow booklet giving additional information.

6004

At the Production Engineering Show, Sept. 6-16, see this and other spring innovations at

BOOTH 204

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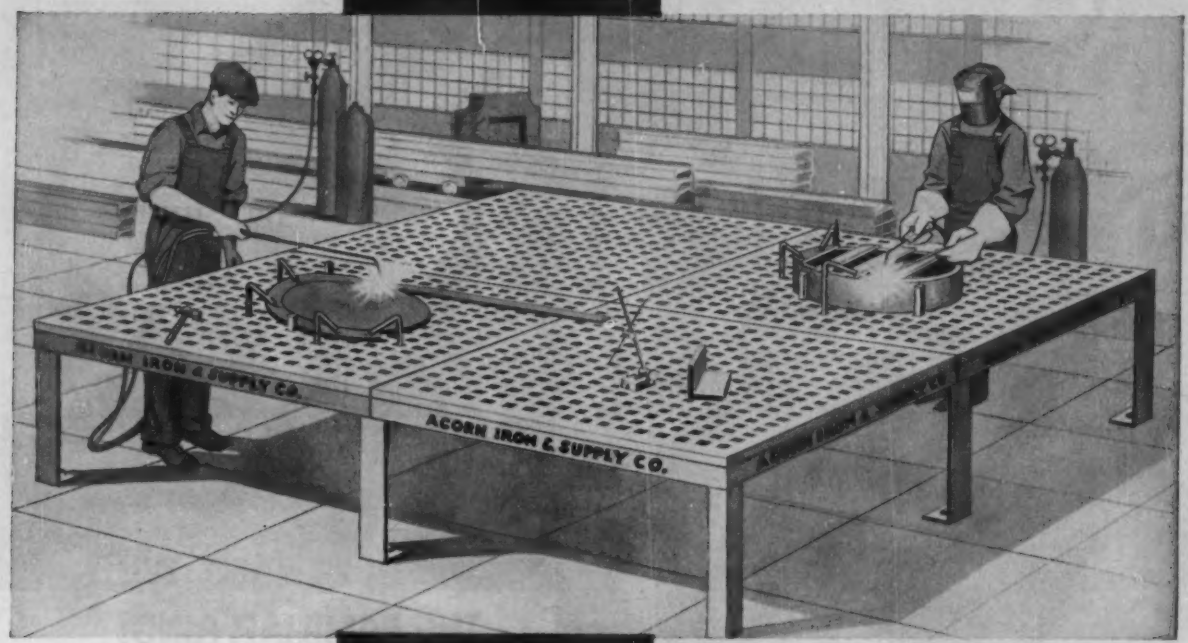
LAYOUT and SET-UP BLOCKS or WELDING PLATENS

TOOLS and ACCESSORIES



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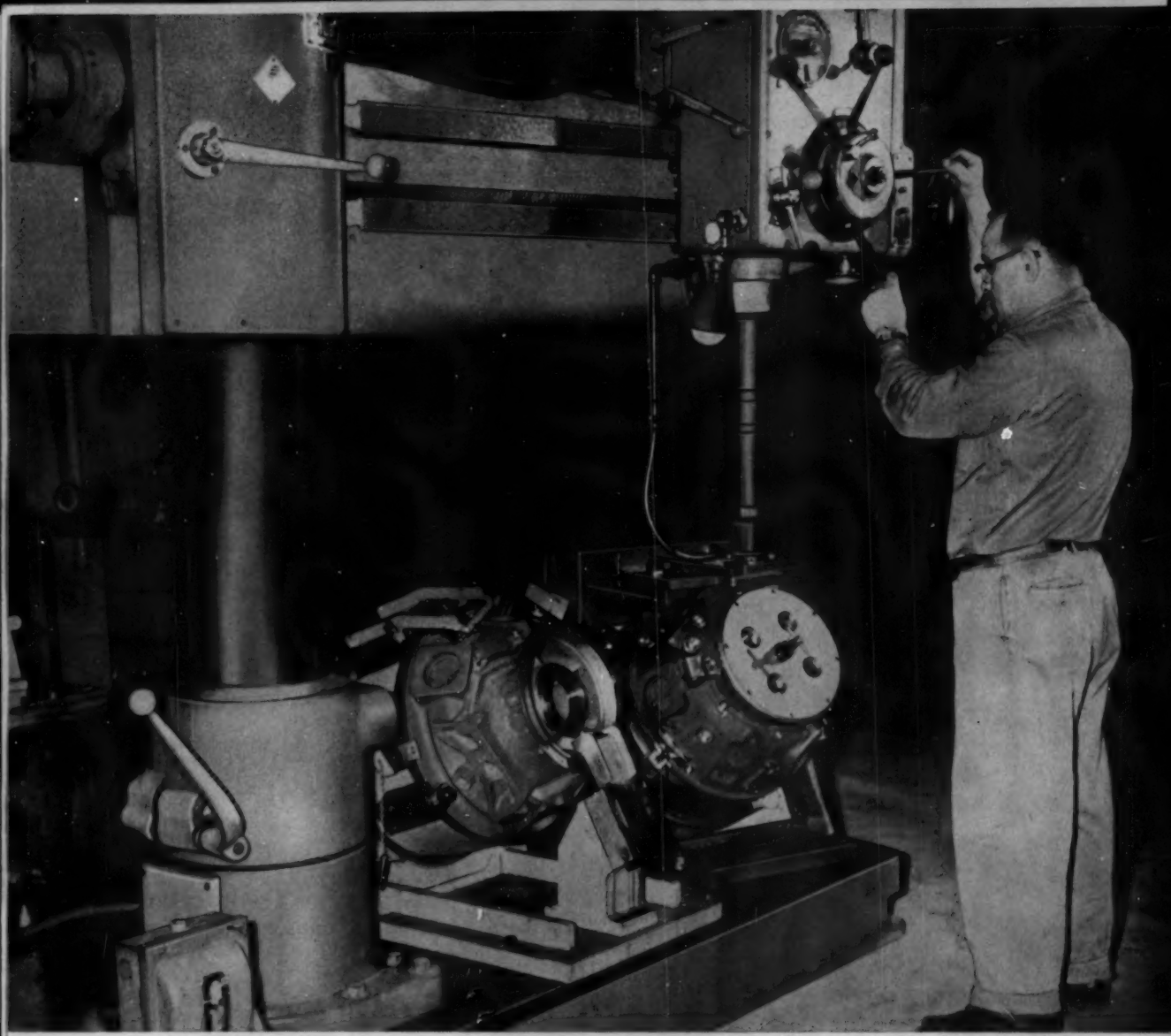

Courtesy Lycoming Division, Avco Corporation

Gilbert radial's "trouble-free" on demanding job at Lycoming

Here's another demonstration that Cincinnati Gilbert radials perform accurately and dependably on demanding jobs for demanding people.

The Lycoming Division of Avco Corporation, Stratford, Conn., uses this machine to drill, ream, countersink and counterbore inlet housings for T53 gas turbine engines. Accuracy must be within plus-minus .0005"; finish within 63 RMS.

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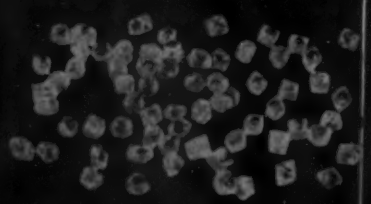

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The diamond tool of those days was a primitive thing—a diamond in a metal shank stuck into a handle. Performance was unpredictable; wastage and diamond loss great.

But, these men had come up through the abrasive wheel business and were convinced that, since abrasive wheels differed so much —in size, bond, type and size of grain, hardness, etc., it was only logical that diamond dressing tools should be different, too; in fact, the ideal tool would be *engineered to match the specific wheel and its work.*

They even believed that such tools could be *guaranteed* to do their intended job.

It was a radical idea for those days; it meant endless research on factory production lines and in laboratories but, it worked. A steady progression of new ideas in diamond tools, new concepts of application and performance flowed from the garage workshop and from the plants that succeeded it, changed diamond-using habits and established an American diamond industry that is unsurpassed throughout the world.

This, we think, is an appropriate time to say "thank you" to our loyal customers and to the members of our company "family" who have made this growth possible and who, together, have brought us to our semi-centennial year.

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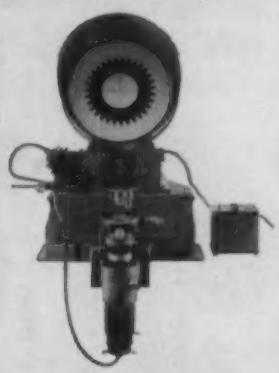

OPTICAL COMPARATOR—BENCH MODEL 2

OPTICAL COMPARATOR—FLOOR MODEL 3

OPTICAL COMPARATOR—BENCH MODEL 6

AUTO-COLLIMATOR—MODEL 1

AUTO-COLLIMATOR—MODEL 3

STEREO MICROSCOPE—MODEL SM2

STEREO MICROSCOPE—MODEL SM

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SIMPLE MEASURING MICROSCOPE

The above is only a partial listing of the many Nikon instruments designed to meet measurement and inspection requirements in production, quality control, intricate parts assembly, and other applications demanding fast, accurate inspection. For complete details, write to Dept. AM-8.

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the complete line Skillfully made Butterfield spiral point taps cut smoothly and accurately, producing more components through longer service life. So it is with all other cutting tools in *the* complete line: hand taps, drills, reamers, dies, counterbores, cutters, end mills, hobs and carbide tools. Phone for quick deliveries or technical aid. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **Call your Butterfield Distributor.**

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A PRODUCT OF SKILL

35B.0.6

TOTEABLE MAGNESIUM HELPS TOOL HUGE NIKE ANTENNA

"We're using more and more magnesium tooling plate in our shop because it's lightweight, easy to machine and has a superior finish," says the Director of Engineering of Steel Products Engineering Company Division of Kelsey-Hayes.

Light Weight. "We use magnesium tooling plate to make jigs and fixtures of various sizes up to seven feet square in our work on the huge Nike-Hercules antenna," he said. "The largest magnesium tools can be transported with a small lift truck, leaving our overhead crane free for other duties. Many of the magnesium tools can be handled easily by one or two men."

Machinability. "The excellent machinability of magnesium is very important since many operations must be performed to get the two sides of our jigs and fixtures parallel to .001."

Dimensional Stability. "Magnesium's dimensional stability allows us to hit milling and drilling tolerances on the finished antenna parts of .0002 to .0005."

NEW Magnesium Tooling Plate Manual covers shop working characteristics, properties, design. Contact the Dow sales office near you or write to THE DOW METAL PRODUCTS COMPANY, Midland, Michigan, Merchandising Department 1030F8-22.

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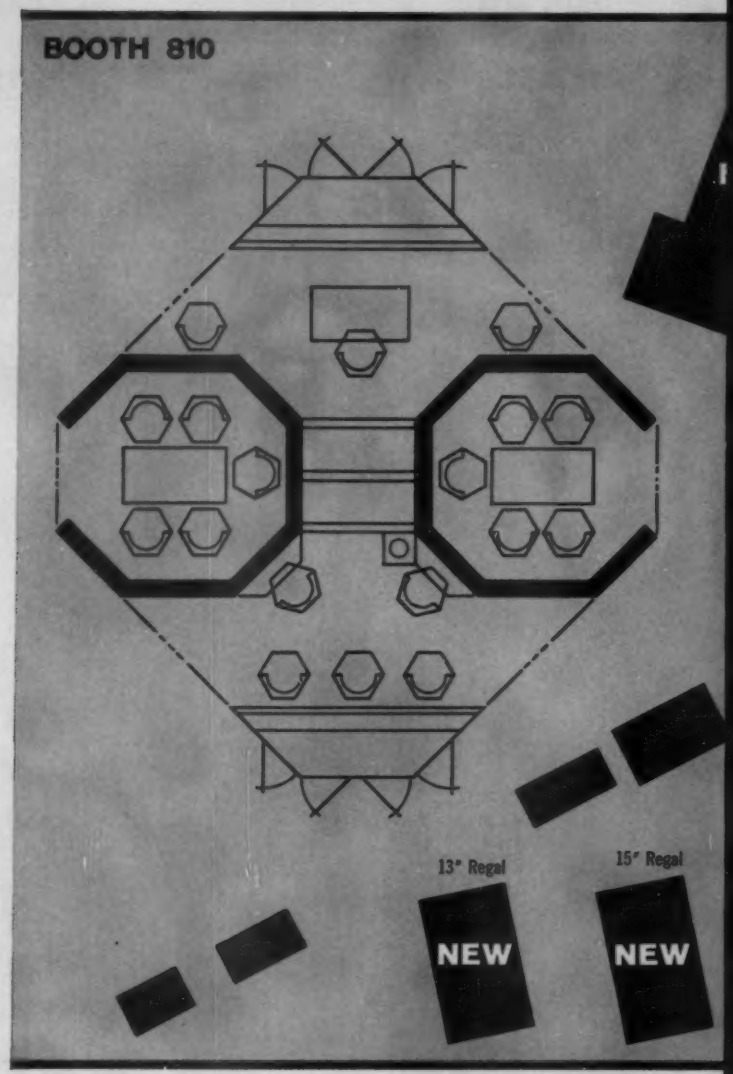
ONE STOP FOR LATHES+

at the

Machine Tool Exposition



Wherever you find lathes—in production, maintenance, toolroom and classroom—you will find LeBlonds doing a magnificent job. LeBlond is the world's largest builder of a complete line of lathes.

Choose the REGAL line for low priced lathes with big lathe features. These favorites for light production, maintenance, instrument work, training, and the toolroom are made in 15 different models from 13″ to 24″.

Look to the HEAVY DUTY line for rugged lathes for peak performance and round-the-clock production. The choice of production departments and tooling programs, LeBlond Heavy Duties are made in 6 different series from 13″ to 120″.

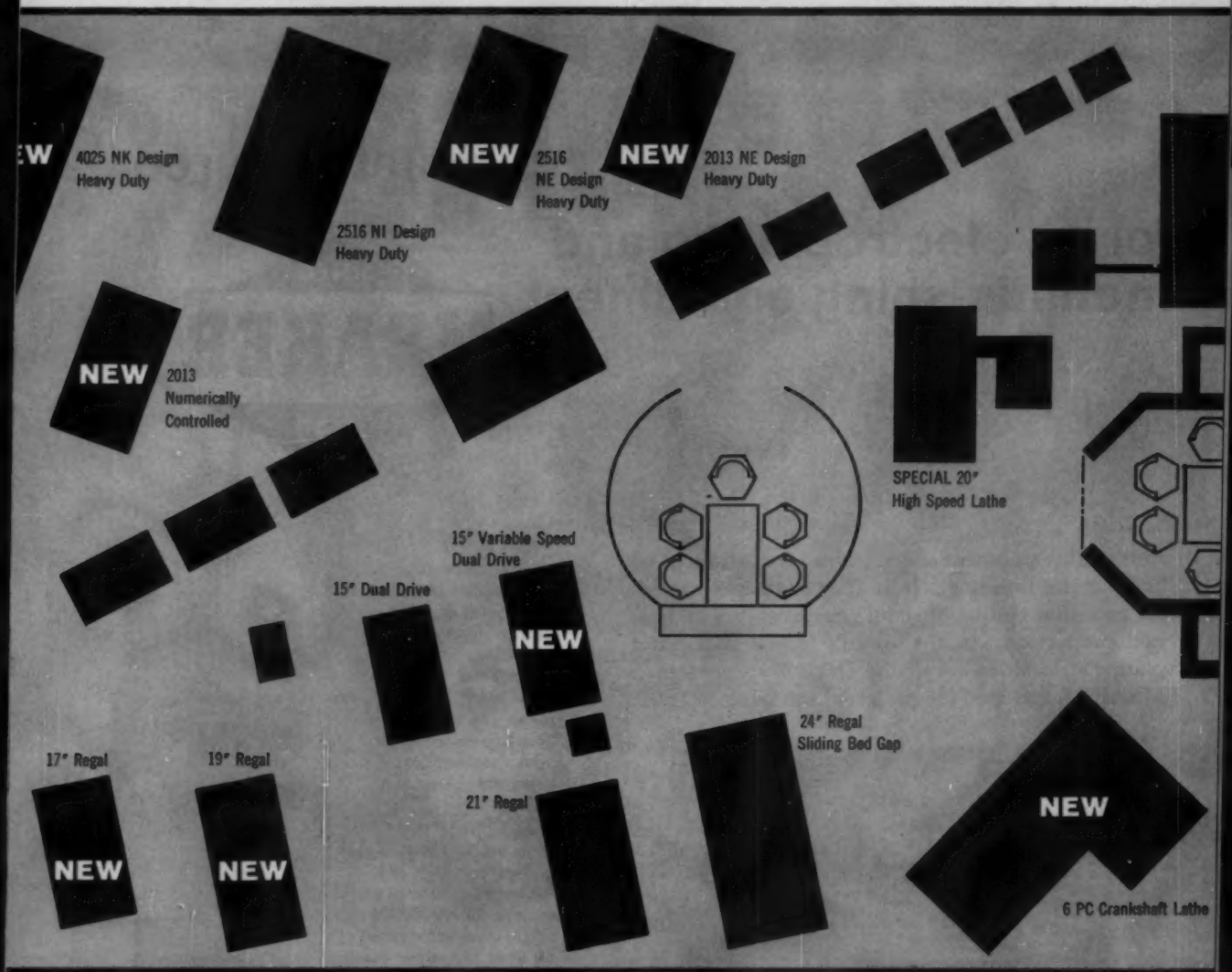
Rely on the RAPID PRODUCTION line for specialized small lathes designed for mass production of specific workpiece categories. Often used with form tooling, they are made in three different models.

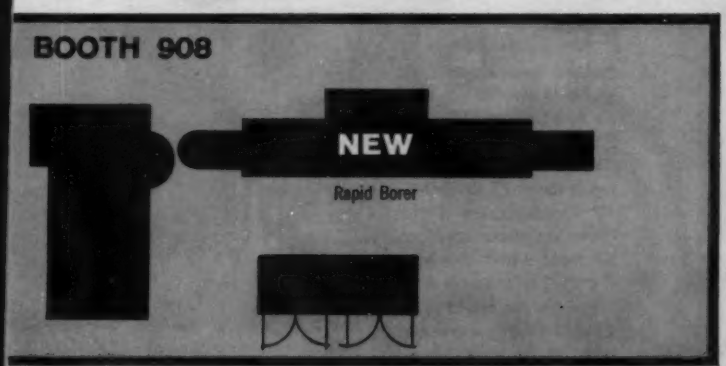
LeBlond builds many of these fine lathes in toolroom, plain bed gap, and sliding bed gap models. They may be fitted with a full line of accessories, including *four* different tracers: Regal-Trace, Hydra-Trace, Two-Directional, and 90°, all made by LeBlond.

Sound engineering with ingenuity, three-quarters of a century of experience, a history of notable contributions to better lathe design—these are reason why we say, "With LeBlond, you cut with confidence!"

10 • SEE LEBLOND IN BOOTH 908 • SEE LEBLOND IN BOOTH 810 • SEE LEBLOND I

CIRCLE 782 READER SERVICE CARD





Cut with confidence

LeBLOND of Cincinnati

The R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio

N BOOTH 908 • SEE LeBLOND IN BOOTH 810 • SEE LeBLOND IN BOOTH 908 • SEE

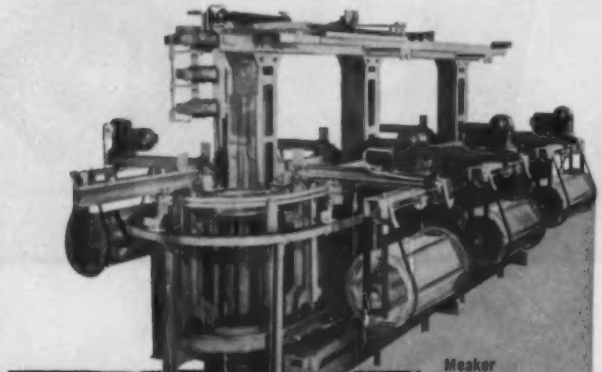
CIRCLE 783 READER SERVICE CARD

ONE complete source

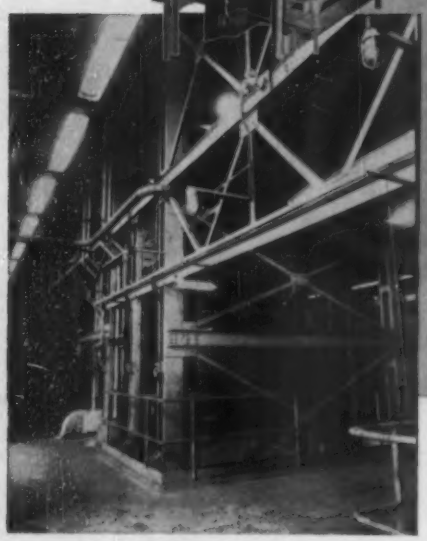
for all electroplating and metalfinishing equipment

SINCE **MEAKER** 1899

Automatic equipment and systems for continuous or batch metal finishing...from the "compact-a-matic" for precision plating of small components with limited production...to the world's largest automatic plating installation occupying 180,000 square feet... MEAKER has been the preferred source *since 1899*.



Meaker "Compact-A-Matic"



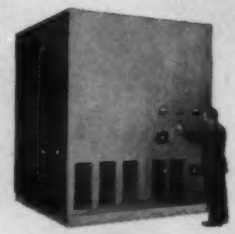
Partial view of world's largest automatic plating installation

Sel-Rex® RECTIFIERS

Silicon • Selenium

Dependable DC power for electroplating, electropolishing, electrocleaning and anodizing.

Units from 25 to 50,000 amps with manual, automatic and remote controls "custom-engineered" to your requirements—at no premium in cost.



Sel-Rex® JET PLATER®

For Precision High-Speed Precious Metals Plating

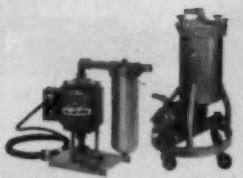
The complete precious metals plating facility in a single compact cabinet can be used for either rack or barrel plating...perfect for precision-plating of critical electrical or electronic parts, specification precious metals plating or "pilot plant" set-ups.

Sel-Rex® SOLUTION FILTERS

Portable and mobile units for all liquid clarification needs.

1) 600 Series—PRE-MET FILTERS. Guaranteed leak-proof operation—flow rates from 25 to 800 GPH.

2) Double-duty Series—New stainless steel mesh element which doubles effective filtration area—flow rates from 250 to 18,000 GPH—greater capacities to order.



1 2

MEAKER **THE MEAKER COMPANY**

Subsidiary of Sel-Rex Corporation

Nutley 10, New Jersey

Factories and offices Chicago 50, Ill., and Nutley 10, N. J.

MORSE DISTRIBUTORS GIVE YOU "ALL THE MOSTS"

Only Morse-Franchised Distributors have The Combination That Counts in cutting tools—line, quality, same-day delivery, technical help, finest research backup!

Whenever you have a cutting tool need—whatever tool problems you encounter—the *first* man to contact is your local Morse-Franchised Distributor. He's the man with "*all* The Mosts" in the cutting tool field—he serves you fastest with the best!

In fact, right now his local stocks are so extensive you can phone him, order the popular Morse tools you need, get them *in hours*. Try it—call your Morse-Franchised Distributor now!

Morse means more production . . . smoother, more accurate production...with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want *Morse Quality*, there's only one way to get it...*specify Morse.*

MORSE

means "THE MOST" *in Cutting Tools*

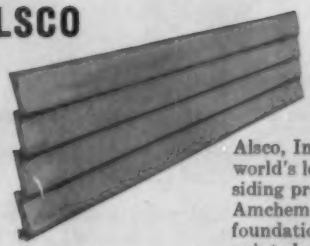
MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASSACHUSETTS

Warehouses in: NEW YORK • CHICAGO • DETROIT • DALLAS • SAN FRANCISCO

A Division of VAN NORMAN INDUSTRIES, INC. VN

7 of the finest in the field specify

ALSCO

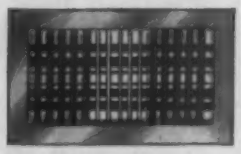


Alsco, Inc., one of the world's leading aluminum siding producers specifies Amchem Alodine® as the foundation for a successfully painted, durable aluminum surface.

GENERAL BRONZE

The Alwintite Division of General Bronze Corp. specifies Amchem Alodine and Amchem Aluminum Etchant for a superior, long lasting finish on their popular line of residential aluminum windows.

KRUEGER



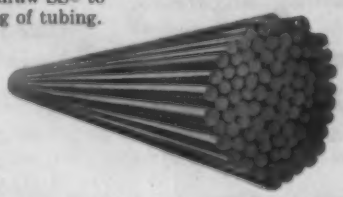
Krueger Air Conditioning Corp. specifies Amchem Granodine® for superior pre-paint protection and paint adhesion on steel registers, grilles and diffusers for air conditioning and heating.

HANOVER

Hanover Wire Cloth Division of Continental Copper & Steel Industries specifies Amchem Alodine as the base for their line of non-glare, corrosion-resistant, color-fast aluminum screening.

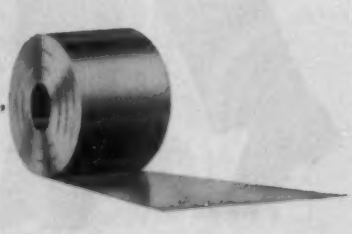
WALLINGFORD STEEL

Wallingford Steel Company, one of the world's largest producers of stainless steel tubing, specifies Amchem Granodraw SS® to facilitate forming of tubing.



CAROLINA METALS

One of the country's top painted aluminum strip processors, Carolina Metal Products Corp., specifies Amchem Alodine for continuous strip pre-paint treatment of aluminum.



AMCHEM for the finest in paint bonding and coating chemicals

BOEING AIRCRAFT

Internationally known Boeing Aircraft Co. specifies Amchem Alodine as a pre-paint treatment, and to treat unpainted portions of the famous 707 jetliner fuselages and engine pods.

If you're looking for superior corrosion resistance, paint bonding and coating performance . . . write for complete information on these and other Amchem chemicals for the metalworking industry.

AMCHEM

Amchem, Alodine, Granodine and Granodraw are registered trademarks of

AMCHEM PRODUCTS, INC.

(Formerly American Chemical Paint Co.)

AMBLER, PA.

Detroit, Mich. • St. Joseph, Mo. • Niles, Calif. • Windsor, Ont.

tool quickly for long or short runs!

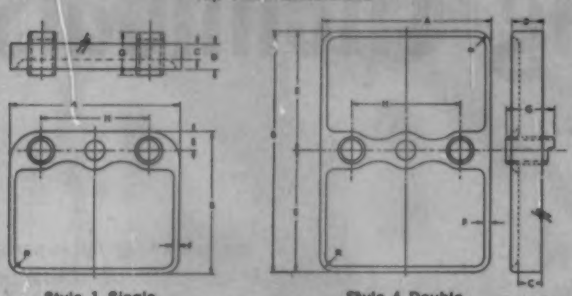
ABC LIFT SWING DRILLING FIXTURES

"Swing Away" features give you . . .

- **Faster Tooling-Up**
- **Faster and Easier Drilling Operations**
- **Choice of Single or Double Top Plates**

INTERCHANGEABLE TOP PLATE ENGINEERING DATA

Top Plate Dimensions



Style 1 Single — Style 4 Double

Top Plate Sizes

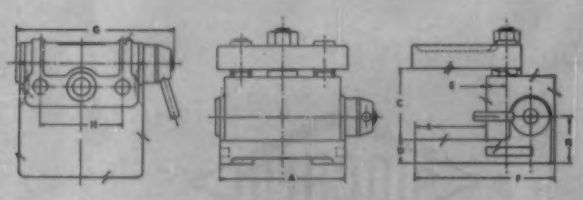
Top Plate Style	Top Plate Number	A	B	C	D	E	F	G	H	R
1	2201	2⅛	2⅛	½	½	7/16	—	¾	1½	9/16
4	2204	2⅛	3⅛	½	½	1 1/16	—	¾	1½	9/16
1	3201	3⅛	3 7/16	½	½	⅝	—	1	2½	⅝
4	3204	3⅛	5⅛	½	½	2 1/16	—	1	2½	⅝
1	4201	4⅛	3⅛	½	⅝	⅝	9/16	1	2½	½
4	4204	4⅛	6⅛	½	⅝	3⅛	9/16	1	2½	½
1	5301	5½	5	⅝	1	⅝	9/16	1⅛	3½	⅝
4	5304	5½	8⅛	⅝	1	4⅛	9/16	1⅛	3½	⅝

Larger sizes and other style single top plates available.

IMPORTANT: When ordering Complete Assembled Lift Swings, specify first 3 digits of Base Number and 1 or 4 to indicate the style of Top Plate desired. EXAMPLE: LS-3221 = 3220 Base with 3201 (Style 1) Top Plate.

FIXTURE BASE ENGINEERING DATA

Fixture Base Dimensions



Top View (Top Plate Removed) — Front View — Side View

Fixture Base Sizes

Lift Swing Base Number	A	B	C Shut	C suggested max. clamp	C Open	D	E	F	G	H	R
2220	2⅛	1⅛	1½	1¾	2¼	1	½	3⅛	3¼	1½	1 9/16
3220	3⅛	2⅛	2	2⅜	3	1	⅝	4½	5	2½	1 1/16
4220	4⅛	2⅛	2⅛	2⅜	3⅛	1	⅝	5	5¼	2½	1¼
5330	5⅛	3⅛	3	3⅜	4⅛	1	1	6¼	6¼	3½	2
5340	5⅛	3⅛	4	4⅜	5⅛	1	1	6¼	6¼	3½	2
5350	5⅛	3⅛	5	5⅜	6⅛	1	1	6¼	6¼	3½	2

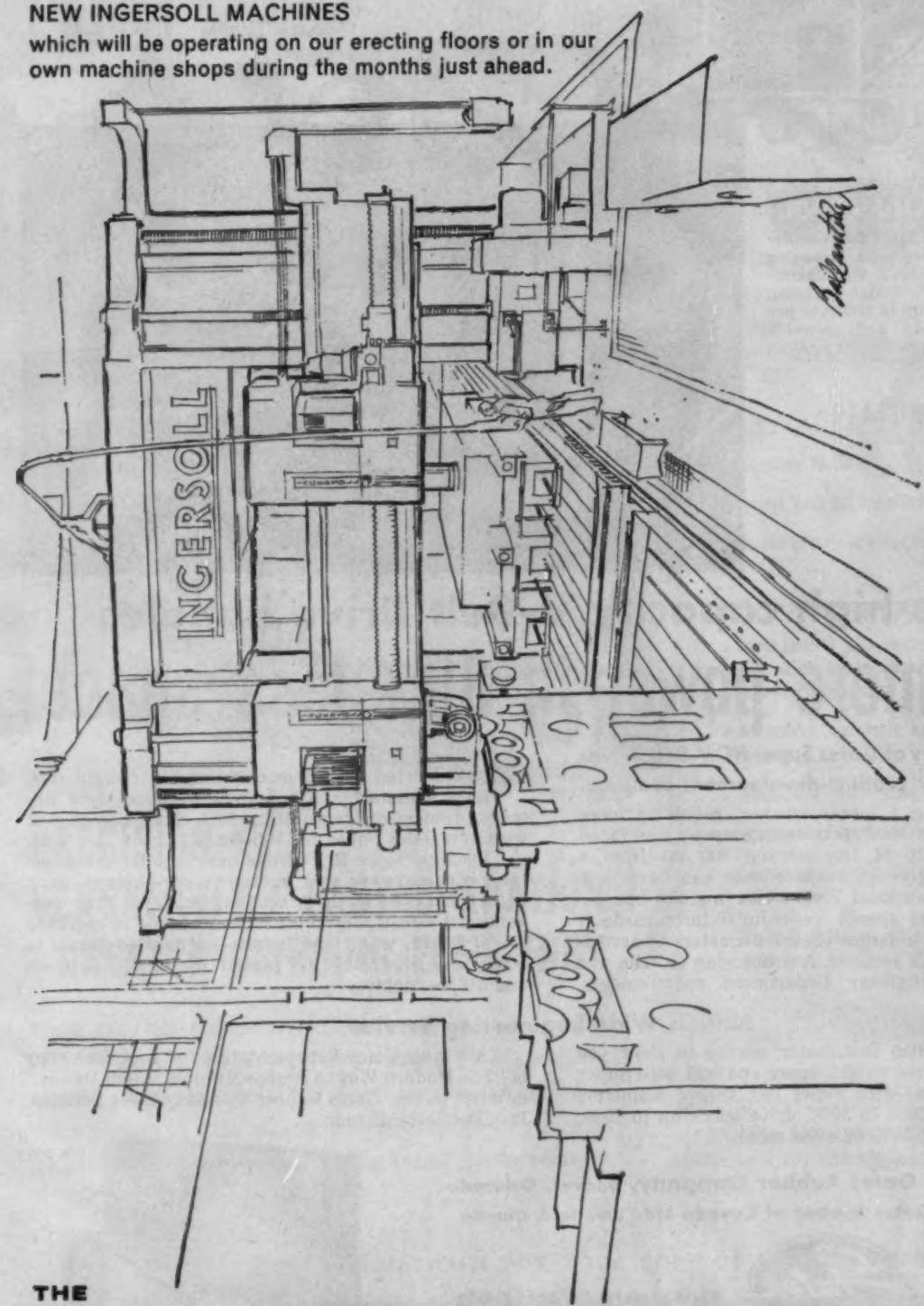
Larger sizes available. For tooling suggestions and complete engineering data write for Catalog LS-60-1.

ACCURATE BUSHING COMPANY

440 North Avenue, Garwood, N. J.

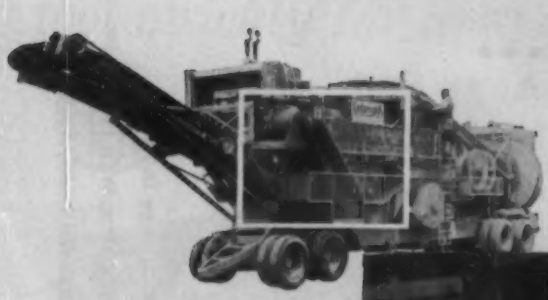
NEW AT INGERSOLL....

This is one of a number of
NEW INGERSOLL MACHINES
which will be operating on our erecting floors or in our own machine shops during the months just ahead.



A NEW 14 FT. ADJUSTABLE RAIL MILLING MACHINE: This 600-ton machine is the latest addition to a large family of new Ingersoll milling machines in use in our shop. It is the world's most powerful general purpose milling machine, with four milling heads ranging from 100 to 250 hp. each. Design innovations include an individual feed system for each rail head, temperature control of spindles, "Read Out" measuring systems and automatic rail leveling.

THE
INGERSOLL
MILLING MACHINE COMPANY ROCKFORD, ILLINOIS



Cedarapids Super Commander Portable Crushing and Screening Plant, built by Iowa Manufacturing Company, Cedar Rapids, Iowa, produces up to 500 tons per hour of crushed and screened material in four different product sizes.

This high capacity V-Belt Drive handles

60% more power in 30% less space!

Higher Capacity of Gates Super HC V-Belt Drives solves complex product-development problem!

In developing a larger crusher, requiring more horsepower, Iowa Manufacturing Company was faced with the problem of transmitting 400 hp from a higher-speed engine in a space that had been just enough for conventional V-belts carrying 250 hp.

At the higher speeds, centrifugal force made it impossible to go to larger sheave diameters to accommodate larger belt sections. A wider span of belts was ruled out by Highway Department requirements, which restricted overall machine width to eight feet.

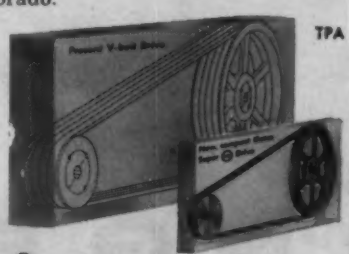
Iowa Manufacturing's designers solved their primary problem of transmitting 60% more horsepower with new Gates Super HC V-Belts.

Because Super HC V-Belts have smaller cross section, use narrower and lighter-weight sheaves, pack higher hp capacity in a smaller 'package' than conventional V-belts, designers also succeeded in reducing drive weight, width and height — a decided bonus in equipment that must be moved frequently both on and off the highway.

Nation-Wide Engineering Service

There's a Gates Distributor nearby to show you how to reduce drive weight, space and cost with Super HC V-Belt Drives. With Super HC, sheave diameters can be reduced 30% to 50%, drive space up to 50%, and drive weight 20% or even more.

Ask your Gates Representative for your free copy of "The Modern Way to Design Multiple V-Belt Drives," or write to The Gates Rubber Company Sales Division, Inc., Denver, Colorado.



TPA 503A

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates *World's Largest Maker of V-Belts*

Gates Super HC V-Belt Drives same hp capacity in smaller "package"

CIRCLE 790 READER SERVICE CARD

PRECISION GRINDERS

MICRO MATIC
HONE CORPORATION
DETROIT, MICHIGAN
MANUFACTURED BY
JONES-SHIPMAN
LEICESTER, ENGLAND

FEATURES:

- Roundness to .00001"
- Surface finish to 1 micro-inch
- Parallel grinding to within .00025" in the center over 24".
- Shockless table reversal at all speeds.
- Table reversal accuracies: .0005" for models 1300 and 1310, and .001" for model 1305, at maximum table speeds.
- Micrometer movements on table and cross traverse.
- Trouble-free, low-pressure hydraulic system.
- Nitralloy wheel spindle running in plain bearings.
- Super-accurate workhead spindle in selected plain bearings.
- Minimum stroke of .020" at maximum table speed.

PRECISION + VERSATILITY + EASY OPERATION =GREATER GRINDING EFFICIENCY

Models 1300, 1305 and 1310 are precision grinders that offer unusual versatility and ease of operation. They assure high grinding efficiency on such operations as: external cylindrical or taper, internal, and cutter or tool grinding. Of simple, accurate and rugged design, these grinders are available in three capacities: 8" swing and 18" between centers; 10" x 27"; and 10" x 40".

SEVERAL types of wheelheads of proven design are available. Also, special attachments to efficiently meet any grinding requirement can be furnished.

FOR FURTHER INFORMATION, WRITE FOR YOUR COPY OF BULLETIN 208M

PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE 791 READER SERVICE CARD

CIRCLE 792 READER SERVICE CARD ►

THE GREATEST ADVANCE IN

REVOLUTIONARY NEW

JET BAND®

VANADIUM CARBIDE BANDSAW

MILLERS FALLS TOOLS

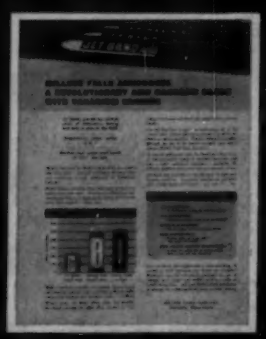
SINCE 1868

BANDSAWING IN 25 YEARS

JET BAND®

Check these advantages:

- Jet Band outlasts . . . outperforms carbon bands 3 to 1 at regular speeds and feeds!
- Jet Band matches high speed steel band performance — yet costs 25% less!
- Jet Band steel is an entirely new alloy — specially developed for bandsaw use!
- Jet Band vanadium carbide is actually harder than a grinding wheel!
- Jet Band cuts even stainless and high temperature alloys on standard machines!
- Jet Band is thoroughly proved — backed by over a year of testing in the field!
- Jet Band has high fatigue resistance!



See your Millers Falls Distributor or write for descriptive bulletin to:

MILLERS FALLS COMPANY

Dept. AM-21, Greenfield, Massachusetts

Atrax

Precision Ground

SOLID CARBIDE TOOLS AND BURS

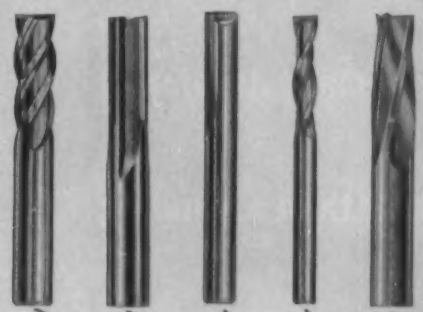
Job Applications

THERE IS AN ATRAX SOLID CARBIDE END MILL ENGINEERED FOR SUPERIOR CUTTING PERFORMANCE ON ANY MATERIAL!

RECOMMENDED APPLICATIONS ATRAX "STANDARD" SOLID CARBIDE END MILLS

202 different "standard" Atrax Solid Carbide End Mills in 20 different series, each engineered for a specific cutting application and recommended for specific materials.

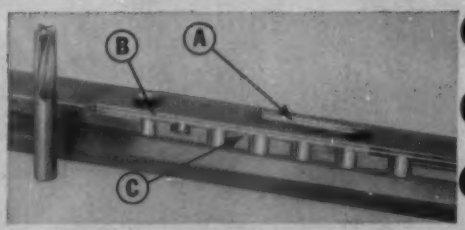
The most widely used Atrax End Mills and the materials on which they are engineered to perform best are shown in this table:



Material	Series 1501	Series 1502	Series 1503	Series 1504	Series 1505
Carbon Steels					X
Free Cutting Steels					X
Nickel					X
Nickel Chrome					X
Stainless Steels					X
Cast Iron		X	X		
Malleable Iron		X	X		X
Brass and Bronze	X				
Aluminum	X			X	
Zinc Alloy	X				
Copper	X				
Hard Rubber	X				
Fibre	X				
Plastics	X				
Monel Metal					X
Toughened & Heat Treated Steel					X
Hardened Steels					X
Titanium					X
Magnesium	X			X	

X—Preferances

TYPICAL SERIES 1505 PERFORMANCE ON ROCKWELL C-64 HARDENED TOOL STEEL WORKPIECE



A Elongating ⅜" slot, 1/16" deep at 700 rpm.

B Step cutting 3/16" wide–3/32" deep at 1150 rpm.

C Counter boring at 1150 rpm.

Note high surface finish and absence of burs and scoring. This Atrax ⅜" 1505 End Mill showed no appreciable wear land after completing three operations on this hard-to-cut material.

Note efficient, uniform chips with no burning and no chatter.

AN END MILL FOR EVERY APPLICATION

There is an Atrax "Standard" Solid Carbide End Mill job engineered for virtually every End Milling application. The Atrax Catalog gives engineering data on speeds, feeds, use of coolants and job hints that will further increase tool life production when you specify and use these superior Atrax Tools.

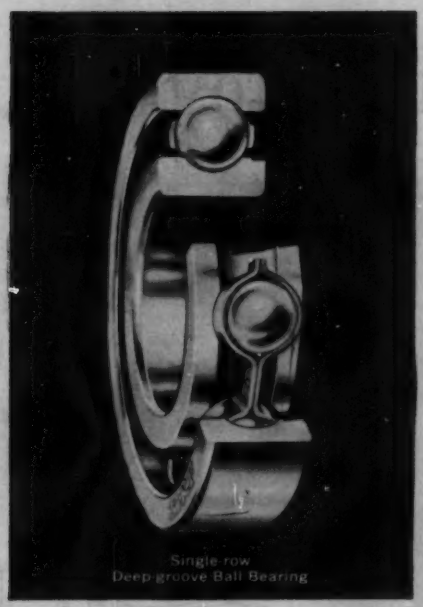
Send for your copy of the 148 page Atrax Catalog

THE ATRAX COMPANY

240 DAY STREET, NEWINGTON 11, CONNECTICUT

◄ CIRCLE 793 READER SERVICE CARD

CIRCLE 794 READER SERVICE CARD



Can a standard bearing offer you "more bearing" for your money?

It can if it's made by SKF—because all SKF bearings, both ball and roller, offer special qualities at "production" bearing prices.

Take the single-row deep-groove ball bearing featured here, as an example. SKF designs and builds this type to sustain heavy radial load and thrust load in either direction. Furthermore, it is engineered to run smoothly and quietly at normal speeds with grease lubrication—and at high speeds with oil.

Yet this is a standard SKF ball bearing, mass-produced by automated production equipment at our plant at Altoona, Pa. You can quickly get this bearing in over 100 sizes, ranging from 5/8" to 15.748" O.D., and in a variety of seal, shield and snap-ring combinations.

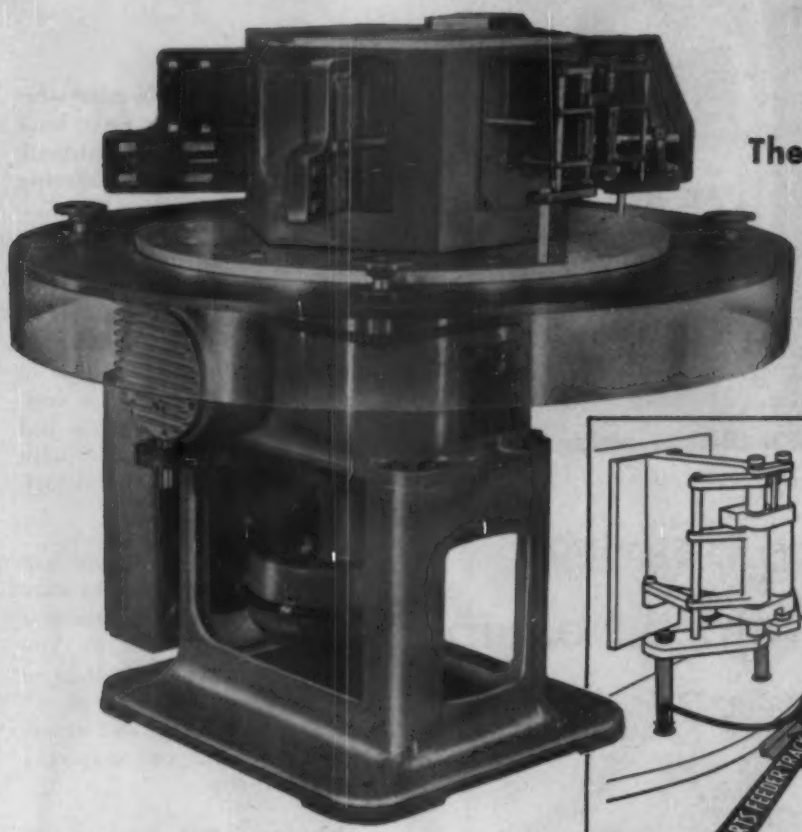
But why not find out what SKF offers in bearing quality, availability and economy? Just call the SKF branch office nearest you.

4001

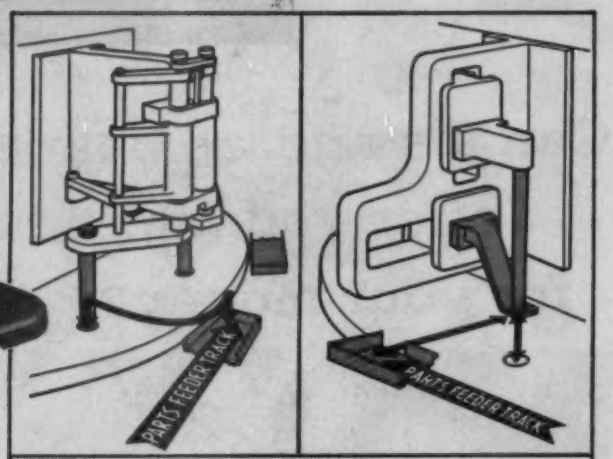
Spherical, Cylindrical, Ball, Tyson Tapered and RBEB Miniature Bearings

EVERY TYPE—EVERY USE
SKF
SKF INDUSTRIES INC., PHILADELPHIA 32, PA.

A NEW APPROACH to AUTOMATIC ASSEMBLY...



The machine tool concept to reduce equipment costs



Two of the standard cam actuated "pick & place" and "push & guide" stations. Each serves two dial positions. Shaded areas indicate those components attached by the user.

For the first time, medium size plants can employ automatic assembly to compete with large scale manufacturers because high volume is no longer a prerequisite to automatic production.

Ferguson's new approach to automatic assembly problems provides a standard rotary transfer machine complete with work stations that furnish parts placing motions right to the dial. The user only adds minor parts holding and positioning devices designed to conform to his production items. At the end of a production run *he changes set-up, as he would for any machine tool*, for operations on a different assembly.

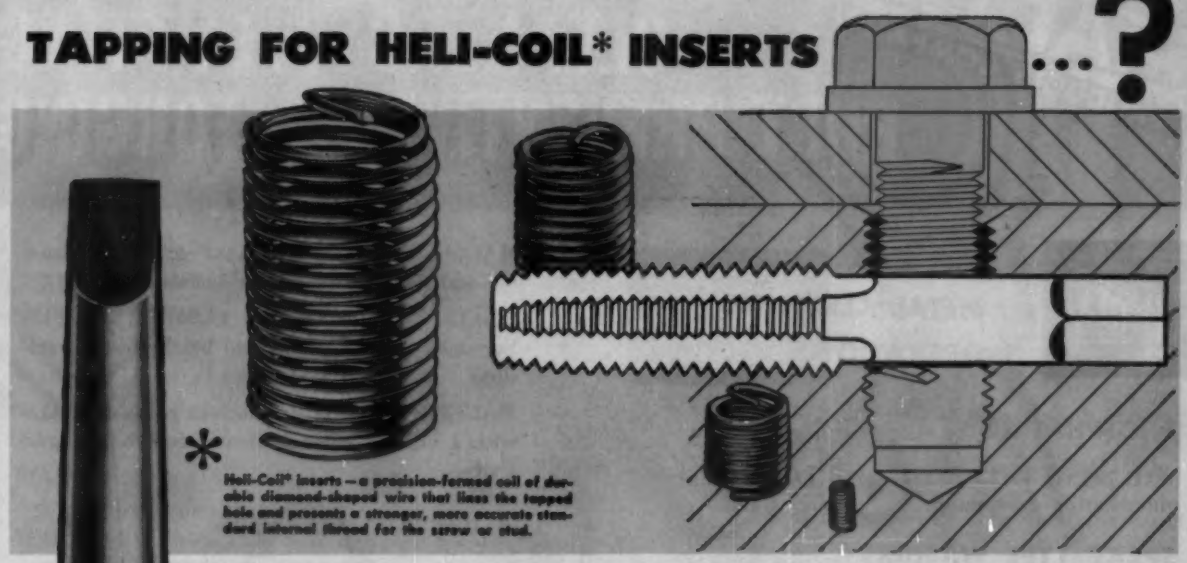
Low initial cost of this standard machine means a fast pay-off on investment. Design versatility makes it adaptable for many uses and guards against obsolescence. And, as with any quality production machine tool, it is built for year-after-year performance with only normal maintenance practices.

SEND FOR CATALOG NO. 602—Get full engineering data. Better still, if you attend the Production Engineering Show, Chicago Navy Pier, Sept. 6-16, visit our Booth No. 246-248 and see it in action!

Hicks Development Division

FERGUSON
MACHINE CORPORATION
A subsidiary of Universal Match Corporation
7818 Maplewood Industrial Court • St. Louis 17, Missouri

TAPPING FOR HELI-COIL* INSERTS ...?



Heli-Coil® inserts — a precision-formed coil of durable diamond-shaped wire that lines the tapped hole and presents a stronger, more accurate standard internal thread for the screw or stud.

...Here's What MOHAWK STANDARD SUBLAND DRILLS can do to save you TIME, TOOLS and $ $

Mohawk Subland Drill-Chamfer "Standards" will streamline those all-important hole drilling operations prior to tapping, by combining both drilling and chamfering into *one* simple, simultaneous one-tool application.

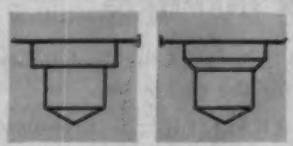
Why chamfer? Because clean, concentric chamfered holes speed tapping, increase tap life and insert accuracy, eliminate breakage, burring or flaking—and lower drilling, tapping and scrap costs.

Mohawk "Standards" are faster and economical to use. They outlast *ordinary* tools, yet remain accurate through regrinds right down to the shank. Better yet, they are available—everywhere!

STANDARD SUBLANDS are stocked in all practical sizes and combinations in 3 step lengths, 3 shank styles.

Short Medium Long

REMEMBER, TOO... Mohawk Standard Subland Drills are also immediately available in Drill-Counterbore and Drill-Drill Types. All practical sizes, step lengths and shank styles.



Subland Drill-Counterbore for Socket Head Cap Screws

Subland Drill-Drill for Tap Drill and Body Clearance

Mohawk TOOLS, Inc.
Montpelier, Ohio

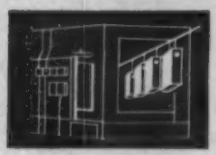
world's largest producer of Subland Drills

*REG. U. S. PAT. OFFICE

MACCO PRODUCTS COMPANY

Single Source of Supply

CLEANERS . . . CUTTING RUST PREVENTIVES . . . FORGING



FOR EXACTING METAL CLEANING OPERATIONS

PHOSPHATING

MAC BOND #71-D: A superior cleaning and phosphating compound.

SPRAY TYPE WASHERS

MACCO MACHINE CLEANER "WRB": The best of alkaline cleaning materials.

MACCO MACHINE CLEANER "T": A combination alkaline cleaning material with rust inhibitor incorporated for either one — or two-stage washers.

MACCO #373: The best of single phase emulsion cleaners.

MACCO #394: The best of diphase emulsion cleaners.

PLATING OPERATIONS

MACCO P. C. #10: An all-purpose plater's cleaner for either ferrous or non-ferrous metals

MACCO P. C. #247-H: A superior anodic cleaner.

MAC BOND: An excellent pickling acid for all plating operations.

PORCELAIN ENAMELING

MACCO H. D. #45-A: A highly detergent soak tank cleaner for the pickle line.

MACCO NEUTRALIZER #2: Economical and efficient neutralizer for the pickle line.

FINISHING DEPARTMENT

MACCO #16-A STRIPPER: A powerful and efficient all-purpose hot stripper.

MACCO COLD STRIPPER #2-A: A liquid for the cold stripping of a variety of paints from a variety of metals.

MACCO BURNISHING SOAP #6-A: For cleaning and brightening of all ferrous metals.

MACCO BURNISHING SOAP #5: For cleaning and brightening of non-ferrous metals.

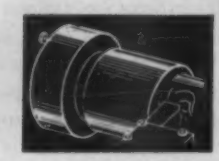
MACCO BURNISHING COMPOUND #43: For deburring, cleaning and brightening operations.

MACCO #139-TC: An efficient paint coagulant with a built-in color indicator for control purposes.

ALUMINUM CLEANERS

MACCO ALUMINUM CLEANER #19-JMA: For the cleaning and brightening of aluminum and zinc plate die cast.

MACCO ALUMINUM CLEANER #40: For the cleaning of all types of sheet aluminum, holloware, etc.



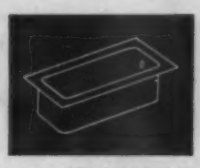
TO IMPROVE YOUR METAL CUTTING RESULTS

MACCO #472-MPA: A water soluble cutting lubricant which is GUARANTEED not to turn rancid.

MACCUT #16 CUTTING OIL: A transparent high grade sulphurized chlorinated cutting oil.

MACCUT CLEAR CUT CONCENTRATE: A highly sulphurized and chlorinated base for blending with cutting oils to increase their efficiency.

MACCO GRIND RITE #141: An excellent water soluble grinding oil which will keep the wheel clean and prevent rust.



DRAWING COMPOUNDS TAILORED TO MEET ALL REQUIREMENTS

MAC DRAW V.E.: Primarily designed for the porcelain enameling industry.

MAC DRAW #294-A: A heavy duty non-pigmented drawing compound.

MAC DRAW #291: A heavy duty pigmented drawing compound.

CIRCLE 798 READER SERVICE CARD

CIRCLE 799 READER SERVICE CARD ►

for every Metalworking Compound Need

LUBRICANTS... DRAWING COMPOUNDS COMPOUNDS... EXTRUSION LUBRICANTS

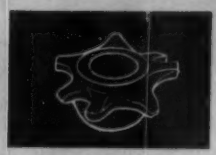
MAC DRAW #96: A heavy duty drawing oil.
MACCO DRI DRAW #3-V: An excellent dry drawing compound.

MAC DRAW #40: A pigmented compound for your stainless steel requirements.

MAC DRAW #94-E: A water soluble drawing oil for aluminum.

MAC DRAW #81-R: A water soluble drawing compound for aluminum.

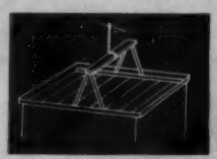
MAC DRAW #8: Primarily designed for the drawing of brass.



FOR EVERY CONCEIVABLE FORGING REQUIREMENT

MAC FORGE #606-C: A proved drop hammer forging oil.
MAC FORGE #599: The best available lubricant for forging presses.
MAC FORGE #204-UP: Excellent for upset forging.
MAC FORGE #933-B: A new development in water soluble forging compounds.

TO MEET EVERY RUST PROOFING REQUIREMENT



MACCO BLUCOAT: An all-purpose water soluble rust preventive. Excellent in spray washers.

MACCO ANTI-RUST #1843-C: A new development in heavy duty water soluble rust preventives.

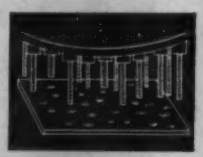
MACCO ANTI-RUST #306: An all-purpose economical rust preventive for use during production or for inter-plant shipment.

MACCO SOLVENT "A": An excellent water displacing rust preventive.

MACCO #10 SOLVENT: A combination solvent type cleaner and rust preventive. Leaves a practically invisible film.

MACCO ANTI-RUST E. C.: For export conditions or outside storage.

FOR UNUSUAL REQUIREMENTS



MACCO EXTRUDOIL #51-DO CONCENTRATE: For all types of cold extrusion work on all types of equipment. A tried and proven product.

MACCO BLUCOAT "TGS": A water soluble quenching medium primarily designed for the fastener industry.

MACCO R. P. #10: A rust proofing spray washer cleaner primarily designed for the fastener industry.

MACCO ROLLER LEVELING OIL #9-A: A new development in a roller leveling oil which combines rust proofing and lubricating properties along with the usual functions of roller leveling oils.

MACCO #400-K: An all-purpose liquid water soluble cleaner suited for the maintenance of floors, walls, machinery, etc.

Research... Development... Control

The enviable position of leadership that Macco enjoys in the metalworking field has been achieved through intensive research and development. In addition, a positive program of quality control assures uniformity of all Macco compounds. To maintain its leadership all the facilities and personnel of the Macco control laboratories are available to you to help you solve your metalworking problems. Call it customer service or whatever you will, it's one of the 'plus' factors that is yours with every drum of compound that bears the name MACCO... another of many advantages that doing business with Macco brings.

THE METALWORKING INDUSTRY LOOKS TO MACCO FOR LEADERSHIP

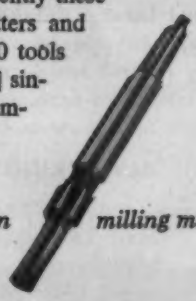
MACCO
PRODUCTS COMPANY

9204 S. SANGAMON ST., CHICAGO 20, ILLINOIS
PRESCOTT 9-0800

styles and sizes for

every milling operation . . .

Today O K Tool offers one of the most comprehensive lines of milling cutters in the industry. It consists of many "firsts": the first single-point tools with interchangeable tool bits for lathe, planer, shaper and boring mill jobs; the first milling cutters with tapered and serrated blades; the first shankless single-point tools. Recently these have been supplemented with quick-change wedge-type milling cutters and over 750 kinds and sizes of solid tools, making a total of over 3000 tools designed to better serve machine shops everywhere. Free catalogs: ☐ single point tools, ☐ milling cutters, ☐ solid cutters. The O K Tool Company, Inc., 400 Elm Street, Milford, New Hampshire.

OK *modern milling* *cutters for* *modern*  *milling machines*

Another New **ARO** Air Motor Produces

SUPER POWER

...brings you

SUPER PERFORMANCE
in new ARO "2200 Series" TOOLS!

1 For SCREWDRIVING
Forward rotation. Quiet exhaust. Model 7856 illustrated, 2,400 RPM. Adjustable clutch.

2 For DRILLING
Big power in compact size! Quiet exhaust. Model 7846 illustrated, 2,400 RPM.

3 For SANDING
Right-angle sander. Quiet exhaust. Model 7944 illustrated, 3,500 RPM. Polishers also available.

4 For GRINDING
Short grinder, aluminum housing. Quiet exhaust. Model 7872 illustrated, 18,000 RPM.

5 For NUTSETTING
Heavy-Duty, Right-Angle. Direct Drive. Model 7825 illustrated, 800 RPM.

Mighty—and eager to prove it! This great new series of ARO super-powered tools gives you more brute power per pound! More speed to slash costs on a wide range of assembly jobs. Greater safety, too—no shock or spark hazard.

Every tool is precision-built, and is more easily adaptable to your specific application. Your ARO Distributor invites you to job-test these new cost-saving tools *now* without obligation!

ARO

®AIR TOOLS
Also Air Hoists . . . Automation Tools
THE ARO EQUIPMENT CORPORATION
Bryan, Ohio
Aro of California, 3141 S. Broad Ave., Los Angeles 7, Calif.
Aro Equipment of Canada Ltd., Rexdale (Toronto), Ontario.
Offices in All Principal Cities

CIRCLE 801 READER SERVICE CARD

CIRCLE 802 READER SERVICE CARD ►

INDUSTRIAL DISTRIBUTOR
SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

All these ... and many more

Whether your threading requirements cover miniature or very large tools, average or extremely close tolerances, run of the mill or space age components, short runs or long repetitive runs, somewhere in the GEOMETRIC line there is a tool for the job.

Precision operation, simplicity of design, interchangeability of chasers, high quality of materials and workmanship have made the name GEOMETRIC mean superlative tools.

If you are not at present a user of GEOMETRICS, we invite your inquiries. If you are a user, we suggest further investigation of the broad line for other applications.

For more information on the COMPLETE GEOMETRIC line, including range of sizes, special adaptations and styles not shown above, call your local GEOMETRIC Distributor, or write to

GEOMETRIC-HORTON NEW HAVEN 15, CONNECTICUT

Visit Booth 345 National Machine Tool Show

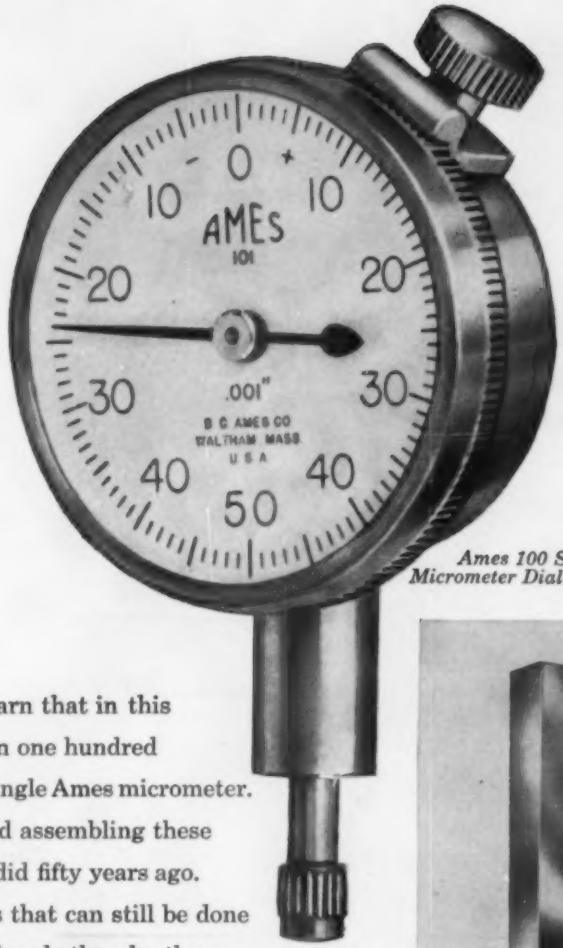
GEO MET RIC

AMES

DIAL INDICATORS

are built by

nonconformists



Ames 100 Series
Micrometer Dial Indicator

Some people might be shocked to learn that in this day of automation it takes more than one hundred separate hand operations to build a single Ames micrometer. In many respects we are building and assembling these precision instruments exactly as we did fifty years ago.

Why? Because there are some jobs that can still be done *better* by a pair of skillful, sensitive hands than by the best automated machinery made. As long as this fact holds true we'll refuse — for *your* sake — to follow the crowd. For Catalog No. 60 write to: B.C. Ames Co., 26 Ames Street, Waltham 54, Mass. — in Canada, H.C. Burton Co., Ltd., 166 Rebecca St., Hamilton.

Representatives in Principal Cities

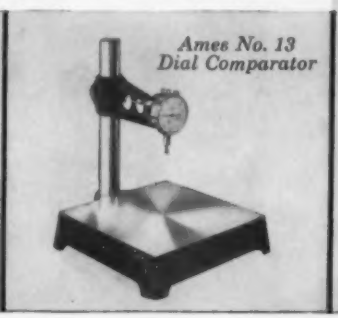
B.C. AMES CO.

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAUGES
ACCU-FLOW AIR GAGES • TRANSISTORIZED COMPARATORS

Ames Long Range
Dial Indicator

Ames 500 Series
Dial Micrometer

Ames
No. 2
Dial
Comparator



Ames No. 13
Dial Comparator

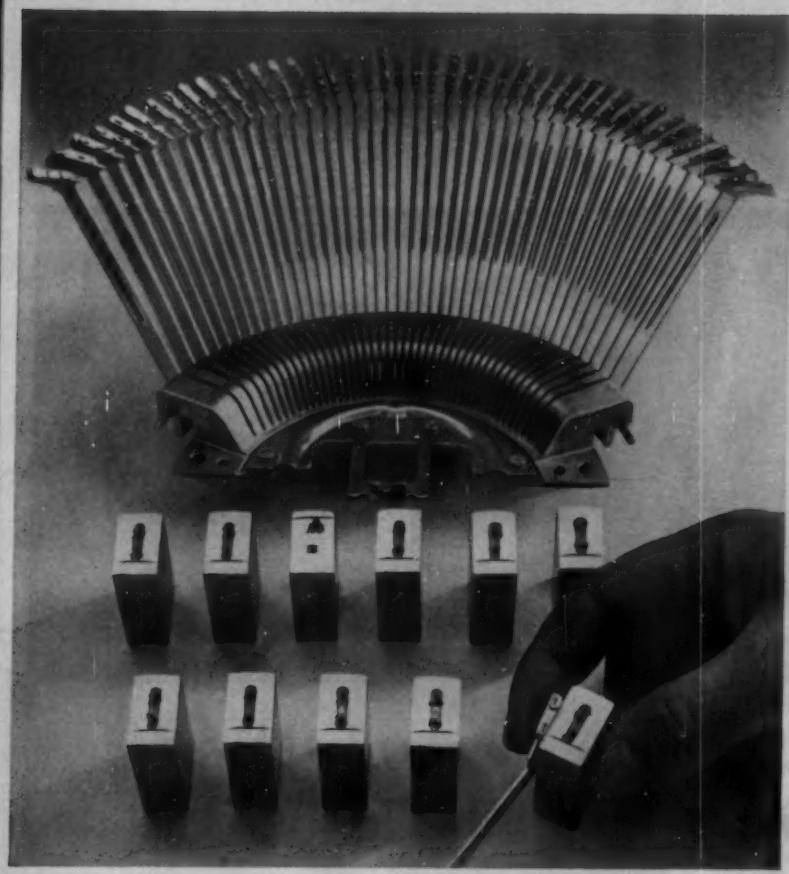
◄ CIRCLE 803 READER SERVICE CARD

CIRCLE 804 READER SERVICE CARD

Tool Steel Topics

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.



IBM makes 200 per cent more type slugs per matrix with Bearcat Tool Steel

Talk about enthusiasm! At the Lexington, Ky., plant of International Business Machines Corp. they have good reason to sing the praises of Bearcat tool steel. Recently, production of type slugs per matrix was improved 200 per cent by changing to a die made of Bearcat. The die "kneads" raised letters of the alphabet into steel slugs.

Bearcat is best known for its remarkable shock-resistance. In this instance, the manufacturer also reported better resistance to wear, and easier machinability (as compared with the tool steel formerly used).

Bearcat is our super grade of shock-resistant air-hardening tool steel. It's ready and willing to handle the toughest shock applications. Because it's an air-hardening steel, Bearcat minimizes both quenching hazards and distortion in heat-treatment.

Like to try Bearcat? Telephone your Bethlehem tool steel distributor.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

TOOLS can be repaired by welding if the proper procedure is used

To incorporate design changes or repair, all tools and dies made of tool steel can be welded successfully if the following procedure is observed:

1. Full-anneal the tools. Good atmosphere control is necessary to avoid scaling and decarburization of the working surfaces.

2. Prepare the crack for welding by "veeing" its full depth and length. Magnetic particle inspection is advisable.

3. Use a welding rod which will deposit steel of the same composition as the tool.

4. Preheat to 400 F - 800 F, and maintain this temperature during welding.

5. Clean the slag from each bead before proceeding with the next bead.

6. Immediately after welding, transfer the tool into a warm furnace (400 F min) and full-anneal.

7. Machine or grind the weld to the desired tool dimensions.

8. Heat-treat the tool by quenching and tempering to the desired hardness, using the standard procedure for the grade involved.

9. Grind the tool working surfaces. The depth of metal removal will depend upon the amount of decarburization produced in Steps 1, 6, and 8.

The use of this procedure will permit the successful welding of tools if it is essential that welding be done. In the majority of instances, however, it will be found both cheaper and quicker to make up new tools.

When emergency welding is done on a production line, it is often necessary to eliminate many of the steps mentioned above, thereby reducing the chances of producing successful welds.

CIRCLE 805 READER SERVICE CARD

SEE IT AT CHICAGO

Modumatic Systems Control–Display

MEASUREMENT • POSITION • INSPECTION

NORDEN DIVISION

Norden Division of United Aircraft Corporation presents advanced but simple systems applicable to your need for faster, more accurate positioning of tool or workpiece

Norden Modumatic Systems feature readout of actual position, automatic positioning, full range origin select, and controlled programing

FOR MEASUREMENT

Series 100—This system displays in straight decimal form the exact position of the tool or workpiece. One display is used for each axis of motion.

Features—Illuminated numbers, readable from twenty feet—individual plug-in decimal units—display unit can be located on machine or remote.

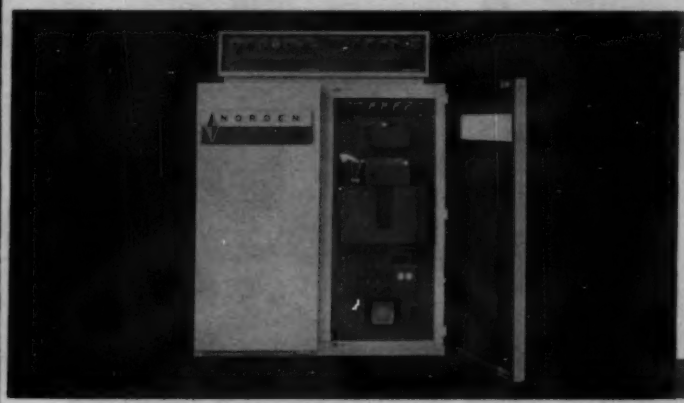
FOR POSITIONING

Series 600—A completely automatic positioning system with input from either manual dial-in switches or punched tape. Display units provide decimal readout of actual position—not command.

FOR INSPECTION

This new Norden concept now makes possible automatic inspection of parts by measuring their exact shape and contour. Since each point on the part's surface has a digital value this information can be easily programmed. Corresponding points on the actual part can be probed automatically and their dimensions compared with the programmed information. The system can be provided with direct numeric print or readout of actual dimensions, deviations from nominal, or out of tolerance indications. In addition, punched tape output is available.

Norden numerical control systems also offer full range electronic origin select. This allows any desired offset to be quickly and easily dialed in by the operator on manual selector switches. In addition, these systems are available with automatic tape punch units for tape preparation "on the machine." This provides a permanent inspection record or a programmed tape for playback applications.

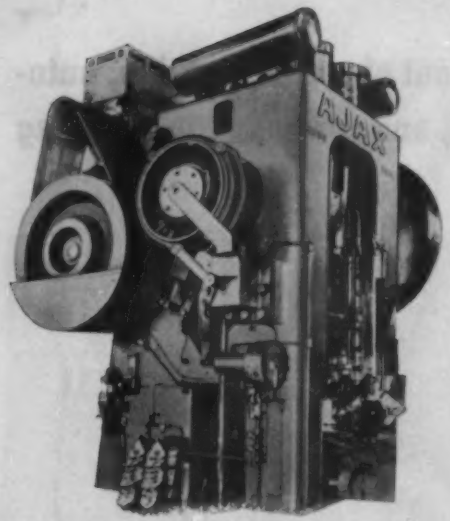


When in Chicago
for the
PRODUCTION ENGINEERING SHOW, NAVY PIER SEE US AT BOOTH 221.
At the National Machine Tool Builders Show see Norden Controlled Machines exhibited by G. A. Gray Company, Booth 1350. Atlantic Machine Tool Works, Booth 543. LaPointe Machine Tool Company, Booth 1229.

For more information contact your nearest Norden Representative. 400 Main Street, E. Hartford, Connecticut, JAckson 8-4811. 11 West Monument Avenue, Dayton 2, Ohio, BAldwin 8-4481, or write us at the address below.

OF UNITED AIRCRAFT CORPORATION
DATA SYSTEMS DEPARTMENT
SANTA ANA, CALIFORNIA

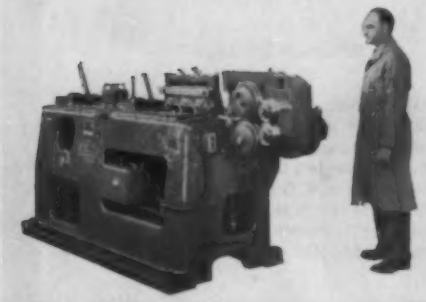
the Ajax line OF METAL WORKING MACHINES



"HIGH SPEED" FORGING PRESSES

Built in 13 sizes from 300 to 8000 tons capacity. Ajax Presses are built with massive, solid, mill housing-type steel frames. Rigid frames assure excellent alignment and accurate die match for the production of uniform and accurate forged parts.

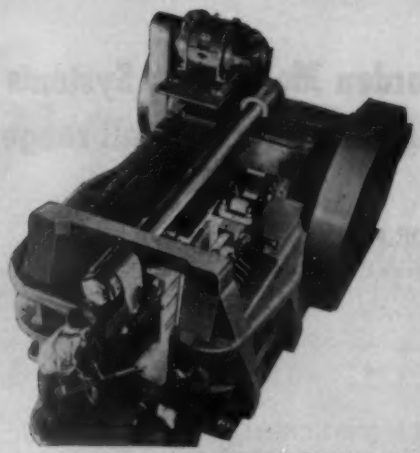
Write for Bulletin 75-C



AJAX-HOGUE WIRE DRAWERS

An attachment for any size cold header and parts former. It cold draws wire in a straight line from hot-rolled stock instead of cold-drawn wire. You save the difference in cost of material and at the same time produce the highest quality cold-headed parts.

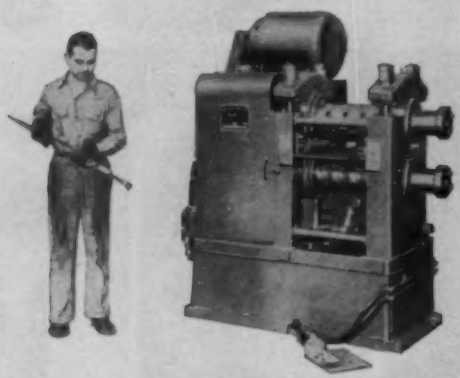
Write for Bulletin 111-B



"AIR CLUTCH" FORGING MACHINES

Choose from a complete line of forging machines—Sizes 1" to 12" to make the forged parts you need . . . Transmission gears —Flanged axle shafts—Crankshaft flanges—Jet Blade Blanks—Implement & Tractor forgings. There's an Ajax Forging Machine for every field of upset forging in industry.

Write for Bulletin 65-D



"WIDE ADJUSTMENT" FORGING ROLLS

Pre-roll your forging blanks for metal saving—longer die life—and better fibre flow. Ajax Rolls are available in 7 sizes to pre-roll forging blanks ranging from connecting rod blanks to the largest propellers. Extension shafts with overhanging dies permit rolling long work.

Write for Bulletin 91-B

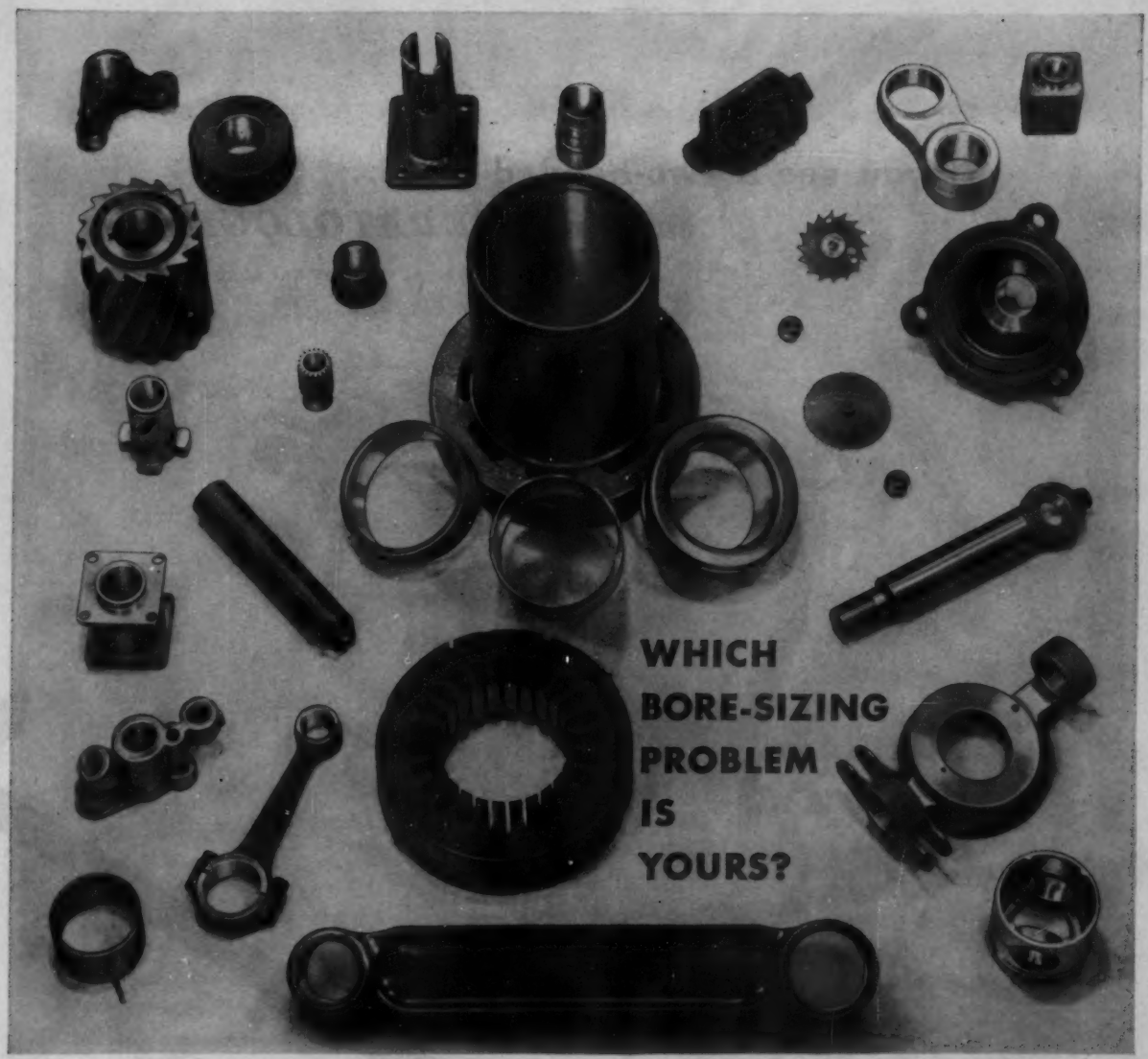
SERVING THE FORGING INDUSTRY SINCE 1875

THE Ajax MANUFACTURING COMPANY

1441 CHARDON RD. CLEVELAND 17, OHIO

CHICAGO OFFICE: 110 S. DEARBORN STREET CHICAGO 3, ILLINOIS

WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.



A Sunnen Honing Machine will handle any hole-sizing job shown here. It's the most versatile machine for all types of I. D. work . . . now used in thousands of shops.

It corrects all previous machining errors with minimum stock removal . . . and guarantees tolerances to .0001" with any desired surface finish.

You pay no premium for the extra precision . . . because Sunnen Honing is a fast, economical abrasive stock removal process.

It handles tandem bores, thin wall parts, blind holes, bores with ports or lands—in any size or shape part. No fixtures, no chucking or set up time.

I. D. range: .100"—2.625" with standard tooling. Built to order thru 4½".

SOLVE ALL OF THEM WITH . . .

SUNNEN HONING

SUNNEN PRODUCTS COMPANY

1920 Manchester Ave. • St. Louis 17, Mo. • Canadian Factory: Chatham, Ontario

TODAY'S TOLERANCES AND FINISHES CALL FOR HONING

If you see a two-headed cow...
call in a *TERATOLOGIST*

(specialist in animal abnormalities)

if your production depends on welding... call in *LINCOLN*

(specialists in arc welding)

AKANSAS implement manufacturer increased his plant production over 30 percent when the Field Engineer from LINCOLN added a Twinarc attachment to his automatic welding installation. With the savings of the first couple of weeks, he bought another Twinarc and further cut costs.

Here's proof that some production problems can be solved without expensive capital equipment purchases. In this case, just a simple attachment did the job—and it was a standard item in the LINCOLN line.

But it takes a working knowledge of the overall production problem to engineer welding applications efficiently. And that's where the LINCOLN Field Engineer comes in. Sure he sells welding—but more than that, he brings manufacturing know-how into your plant and solves his assigned problem without creating a dozen new ones. He's not only an engineer, he's a weldor. He rolls up his sleeves and demonstrates his recommendations. And, as he engineers the application, he relates it carefully to the overall production operation.

That's why we say it's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a "plus" at no charge.

THE LINCOLN ELECTRIC COMPANY
Dept. 1630 • Cleveland 17, Ohio

LINCOLN WELDERS

Select from full lines to operate and control a single OEM product ... or a plant's entire production line!

Air circuits perform no better than each component. In addition to quality air cylinders and valves, you need accessories of proven reliability. Schrader has them in full lines to make compact, rugged air systems that will install easily, perform tirelessly. See your Schrader distributor who has everything you need, plus factory-trained experts to give you ideas and assistance.

The complete range of sizes and types of air circuitry products is stocked and cataloged by your Schrader distributor. Consult the yellow pages or write Schrader.

Schrader®
a division of SCOVILL

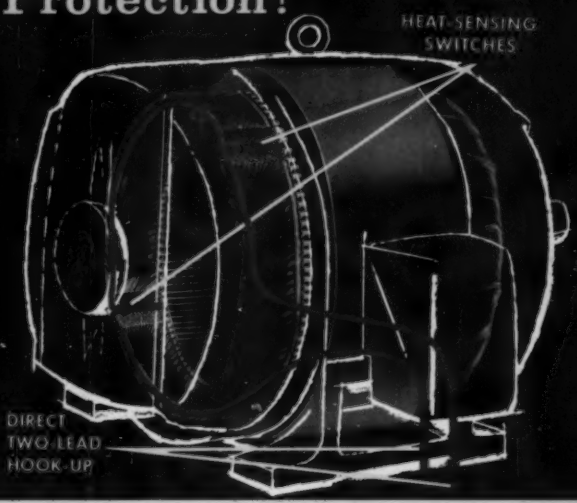
A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

GENERAL ELECTRIC

New Concept in Motor Protection!

Tri-Clad '55' Thermo-Tector SYSTEM ENDS OVERLOAD BURNOUT!



General Electric offers a *totally new* type of protection on *all* Tri-Clad '55' motors 7½-125 hp!

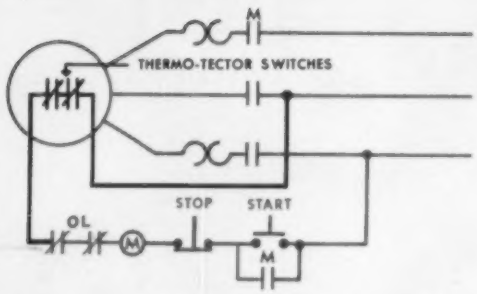
Exclusive THERMO-TECTOR system has heat-sensing switches buried in stator windings. Switches shut off motor *only* when stalls, overloads or other conditions threaten heat damage to motor windings.

Unique THERMO-TECTOR system "anticipation" feature varies motor shut-off point according to rate of winding heat rise. This flexibility allows *maximum motor output* under all conditions.

TURN PAGE FOR FURTHER INFORMATION

NEW Tri-Clad '55' THERMO-TECTOR SYSTEM

Allows Full Motor Output— No Wasteful "Safety Margin" Needed



Thermo-Tector system needs no costly amplifying relays, connects directly to any G-E motor controller.

You get full output from Tri-Clad '55' motors with Thermo-Tector system. Variable response feature of heat-sensing switches allows motor to operate right up to safe limits under any operating condition.

Thermo-Tector switches are offered on *all* Tri-Clad '55' motors in frames 254U-445U. For more information, contact your G-E Apparatus Sales Office or write for Bulletin GEA-7092, Section 866-03, Schenectady 5, N. Y.

SMALL AC MOTOR & GENERATOR DEPARTMENT

GENERAL ELECTRIC

IT PAYS TO STANDARDIZE ON STANSCREW

Stanscrew service, complete selection save trouble, money for Deming Pumps

The Deming Company of Salem, Ohio has stringent requirements for fasteners. They must be of the highest quality to maintain Deming's outstanding reputation for dependability and low maintenance. And, since Deming produces the world's broadest selection of pumps for home, farm, municipalities and industry, they need a fastener supplier with a complete selection to meet a wide range of applications.

Using Stanscrew products and services, Deming fills these demanding requirements and receives many bonus benefits. For example, the Stanscrew fastener specialist and their Stanscrew distributor have provided technical assistance and stocking suggestions which have allowed Deming to reduce inventory in several instances, for significant savings.

Industrial leaders in every phase of industry are learning the wisdom of specifying Stanscrew for fasteners. A complete selection of over 5500 different types and sizes provides dependable, economical answers to the overwhelming majority of industrial requirements. Stanscrew's complete stocks at three convenient plants provide insurance against delivery interruptions. And, a really fast delivery policy avoids costly production interruptions in emergencies.

Call your local Stanscrew distributor today. He will be happy to arrange a prompt visit from the Stanscrew fastener specialist. Often his suggestions on assembly procedures, inventory adjustments or fastening techniques can cut your costs.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

COST CHECK
5-4-5

3M'S "COST CHECK 5-4-5" PROGRAM CAN HELP YOU DISCOVER:

- ✔ IF YOUR GRINDING CAN BE DONE MORE ECONOMICALLY
- ✔ IF YOUR FINISHING IS AS EFFICIENT AS POSSIBLE
- ✔ IF YOUR POLISHING CAN BE DONE FASTER AND BETTER

3M Announces....

COST CHECK 5-4-5

a cost analysis program for grinding, finishing, polishing

3M's new "Cost Check 5-4-5" program can help point the way to lower costs and higher profits for you. And it's easy to do with the Cost Check review form we provide for your use.

All you do is jot down the facts requested on the simple job description page, and you're ready for a review and brief discussion with your local 3M Representative.

Here's the expert assistance 3M's "COST CHECK 5-4-5" offers you:

* 3M's background of 58 years of experience in producing new and better coated abrasives for every phase of industry.

* 3M's technical knowledge of advanced methods, based on creative research in new applications of coated abrasives for every type of industrial job.

* 3M's research programs that provide the latest products and applications that are available anywhere—to help you cut costs, improve profits.

* 3M's trained representative who can call upon this vast array of experience and talent to answer your questions and give you on-the-spot recommendations.

Take Advantage of 3M's new "Cost Check 5-4-5" service without obligation. Fill out and mail in the coupon and your Cost Check kit will be sent to you promptly.

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

3M COATED ABRASIVES

3M COMPANY, Dept. AAA-80
900 Bush Ave., St. Paul 6, Minn.

Send me my "COST CHECK 5-4-5" Kit.

NAME _____

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ARMSTRONG

TOOL HOLDERS

A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs.
Write for literature.

If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.

See Us at Booth 238
PRODUCTION ENGINEERING SHOW
September 6-16
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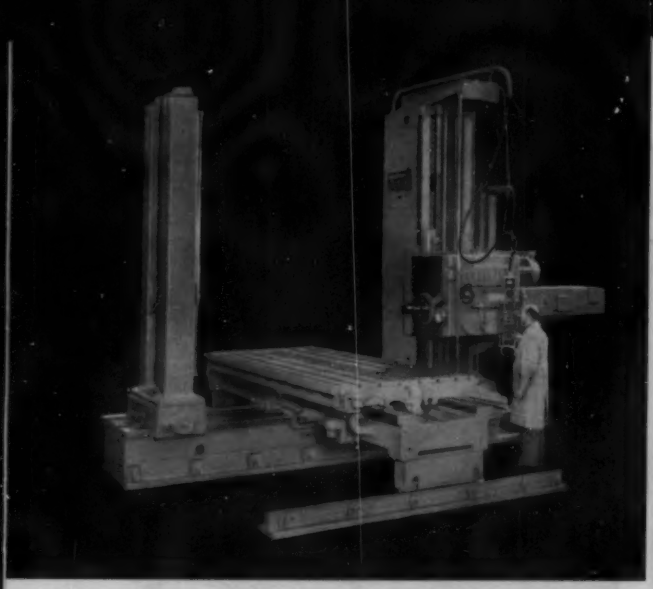
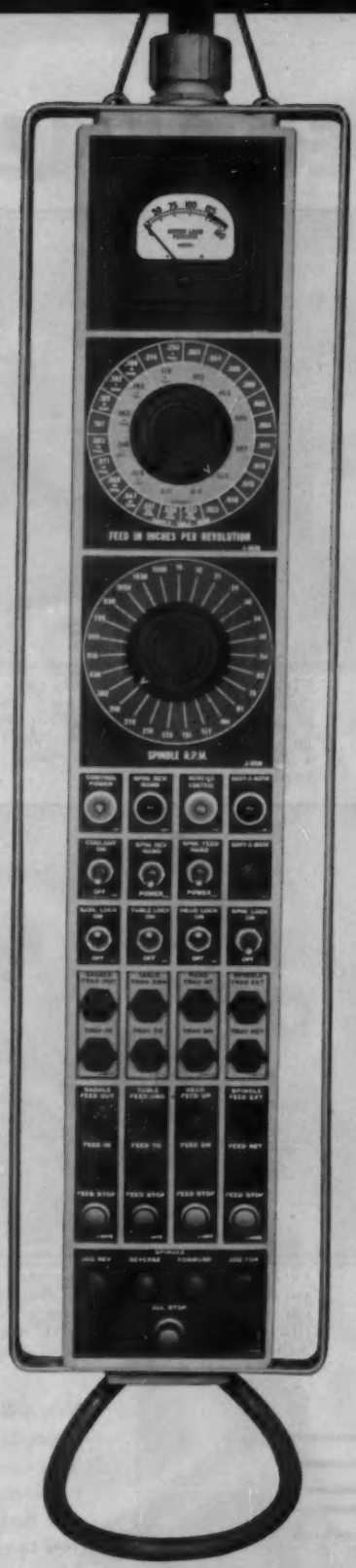
ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. CHICAGO 46, ILL.





15 ways to profit– at your fingertips

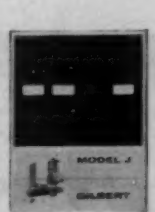
Put this pendant station in the hands of your operator, and he will obsolesce any table type boring mill your competitors may have. At his command will be a system of features calculated to increase your boring, milling, and drilling profits:

1. Operator can see the cutter while controlling machine.
2. Pre-selective speeds & feeds; power automatic shift.
3. Built-in reversible motor (no long shafts or bevel gears to spindle drive).
4. Spindle hardened to full 5/32" depth; hardened taper.
5. Spindle speeds up to 1500 rpm.
6. Automatic depth control for full travel of spindle.
7. Screw feed to spindle.
8. Milling feed calculations by chip load per tooth.
9. Up to 25 hp motors available.
10. Anti-friction bearings throughout.
11. Hardened bed & saddle ways; non-metallic head ways.
12. Pressure or splash lubrication to all running parts.
13. Long narrow guides, screw feeds within guides.
14. Wide selection of column, table and bed sizes.
15. Wide selection of accessories, such as automatic positioning, tracer controls, tape controls, extended saddles with supports, power tool lock.

Our quotation will convince you that this is an exceptionally good machine tool buy.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman St., Cincinnati 23, Ohio.

Write for free catalog



GILBERT

CIRCLE 818 READER SERVICE CARD

SEE SENECA FALLS AT....

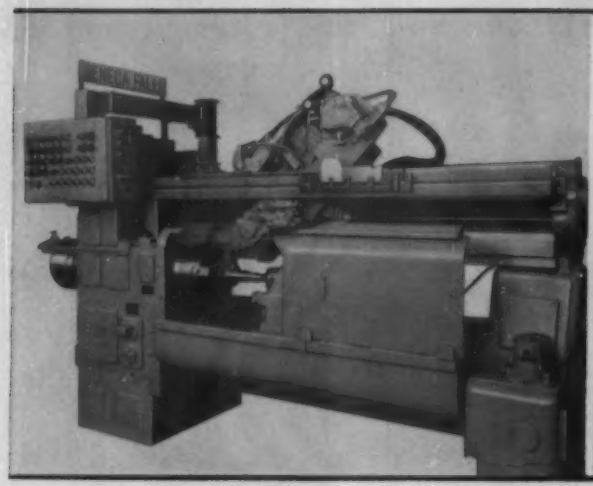


FIG. 1. The 40 H.P. Seneca Falls Model LQ Double-Way Tracer Lathe combines the best and fastest methods of rough and finish turning shafts in one operation. 10½" swing x 26' to 110" (in five increments) between centers.

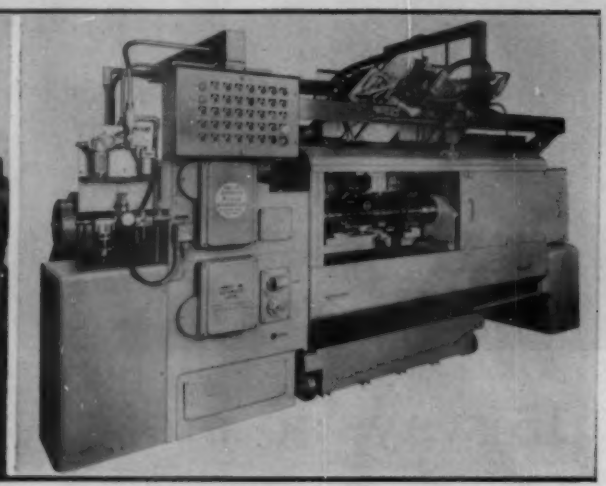


FIG. 2. 60 H.P. Model AQ is a larger version of the Model LQ, offering the same advantages. Rough turning is accomplished with multiple tools or tracer tools on the lower carriages; finish turning with one or more tracer tools on overhead carriage.

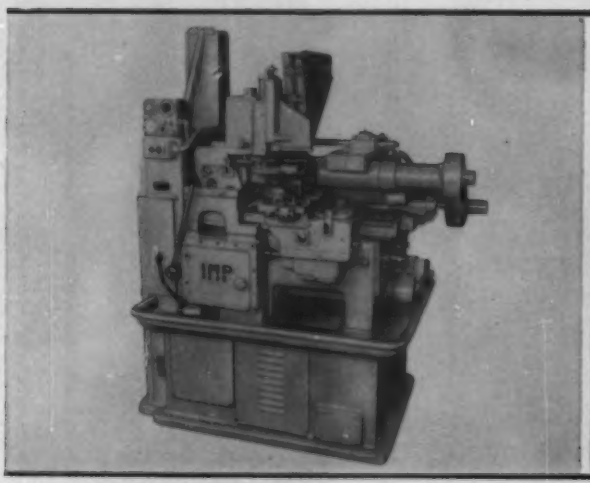


FIG. 5. Model N Cam-operated Lathe is a small Automatic, for work demanding high speeds and extreme accuracy. Machine illustrated is equipped with a rotary type Automatic Loader for pump gears.

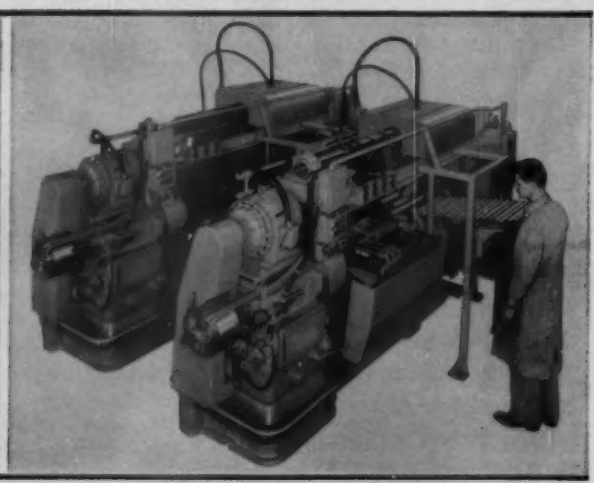


FIG. 6. Two Model LR Automatic Cam-operated Lathes equipped to automatically load, unload, transfer, turn several diameters, face and chamfer both ends of 1½" x 22' electric motor shafts.

SENECA FALLS MACHINE

You will see several Seneca Falls Machines in operation at our booth, all of them exemplifying the Show's slogan, "Modern Machine Tools = Production Efficiency." You can watch the sensational Model Q Tracer Lathe go thru its paces on typical production work. We will demonstrate the practical advantages of its many distinctive features: how change-over is simplified by a numerical control system; how you can rough and finish turn in one operation by using an indexing tool block; how easy it is to load and unload; how the template is located clear of the chip area;

ENGINEERED FOR PROFIT

BOOTH 231

THE MACHINE TOOL SHOW

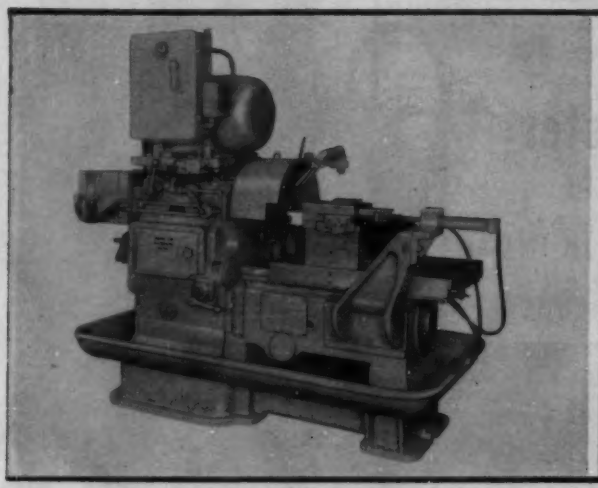


FIG. 3. The Model LN Platen Type Cam-operated Lathe is fully automatic and designed principally as a chucking machine, ideal for a wide variety of work requiring large swing, high spindle speed, multiple tooling and fast cycling.

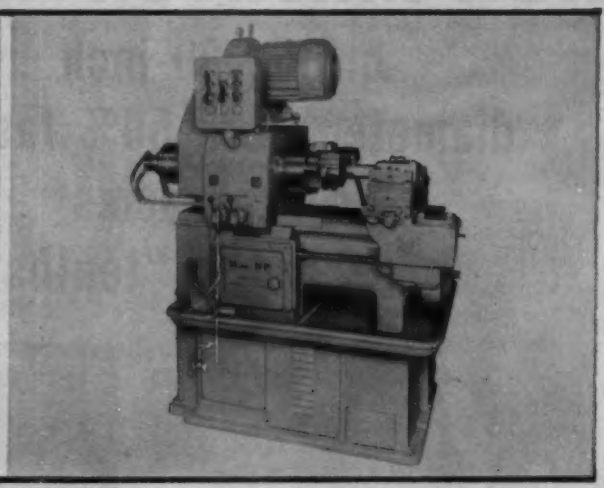


FIG. 4. Model NP is a top quality, reasonably priced Precision Boring Machine made in two types; SINGLE SPINDLE and DOUBLE SPINDLE with unitized heads mounted on a fixed bridge.

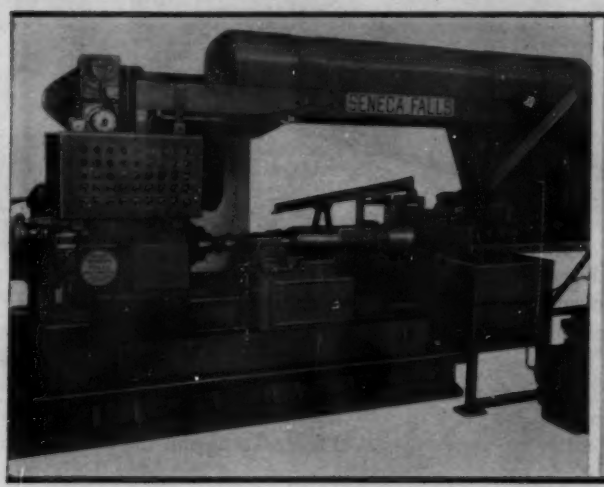


FIG. 7. Model AR Automatic Cam-operated Lathe, equipped with Automatic Loader and Transfer Equipment for handling and machining rear axle stem pinions.

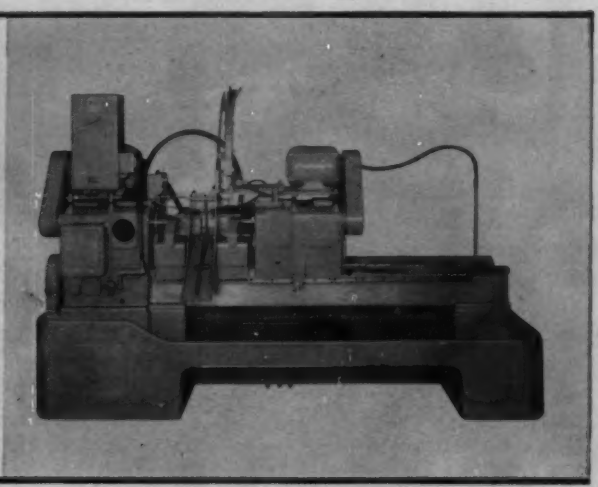


FIG. 8. Seneca Falls Model CS Automatic Drilling and Centering Machine equipped with special Automatic Loader. Operation consists of chamfering both ends of piston pins on a high production basis.

and many other cost and time saving ideas.

Seneca Falls has been building fine Machine Tools since 1864. Lo-swing Lathes were among the first machines to demonstrate the advantage of multiple tool turning. As pioneers in the field of automation, Seneca Falls engineers have faced just about every work loading, work transfer and machine control problem encountered in the turning and centering field. The benefits of this experience are at your disposal.

MODERN MACHINE TOOLS MMT-PE PRODUCTION EFFICIENCY

MACHINE TOOL EXPOSITION

New Mattison No. 60

grinds 90-inch diameter work 50% faster to accuracies measured in "tenths"

Now Mattison combines proved Quick-Tilt efficiency, up to 125 hp at the spindle, continuous downfeed, and full grinding rigidity in all-new vertical spindle rotary surface grinder. Designed especially for heavy stock removal and accurate finishing on large castings, Mattison's new Model 60 can increase standard machining production 50% while grinding dead flat finishes on 90-in. diameter work.

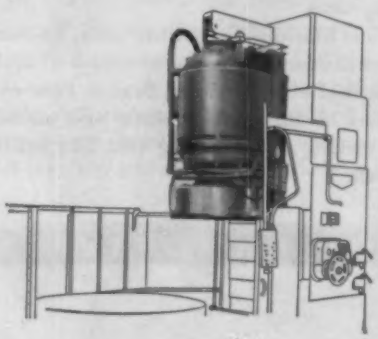
Converts from a rougher to a finisher in seconds

A single setup combines rough and finish grinding on the No. 60—positive cutting action and perfect accuracy on every job, *every* part! With *power* spindle tilting, you rough out the workpiece, grinding on the leading edge of the wheel. Simple flick of the Quick-Tilt switch returns the spindle to vertical position for a fast spark-out.

To appreciate the full significance of savings made possible with Mattison's Model 60, look at the over-all design. Here is a surface grinder with sufficient power to furnish greater unit pressures per wheel grain. Its high horsepower and structural rigidity mean you can take advantage of modern wheels and heavier chip loads for machining large, heavy pieceparts.

125 horsepower increases productivity

Stock removal is a function of horsepower, and a grinder rigid enough to utilize maximum horsepower without deflection or vibration puts more finished work on the floor at the end of the day.



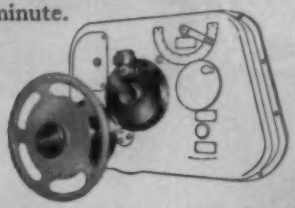
Mattison's Model 60 uses up to 125 hp to hold grinding wheels into the work. On roughing cuts, you can keep the ammeter in the red—then you are *cutting* metal, not scratching it off. Also, you avoid finish and wheel life headaches caused by heat generation.

With the spindle tilted, you can start your job with a "hard" cut. High downfeed rate and positive cutting action give you fast stock removal. Dull grits tear out automatically, eliminating downtime for wheel dressing.

A total of 850 precision ball bearings, spaced in four rows between table and carriage ways, reduces power requirements for machining extra-heavy pieceparts.

New continuous downfeed increases accuracy and productivity

Downfeed on the Mattison No. 60 is continuous—from .005 to .165 in. per minute.



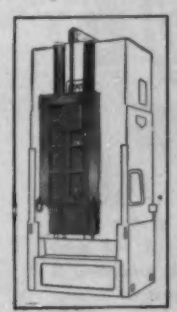
When you reach size, feed stops instantly—not one increment away. You can split the last increment of a ratchet-type feed and meet closer tolerance limits.

There's no feed rate limitation imposed by cam and linkage actuation. The machine will feed at .200 in. per minute (special) if needed. Long-range predetermined stops (.001 in. to .240 in.) increase efficiency on high stock removal jobs. Operator sets the feed and grinds to size in one uninterrupted cut without miking.

Wide feed range gives exactly the right cutting condition for a roughing or finishing cut, in accordance with material and horsepower distribution in the wheel.

Rigid, one-piece column key to increased productivity

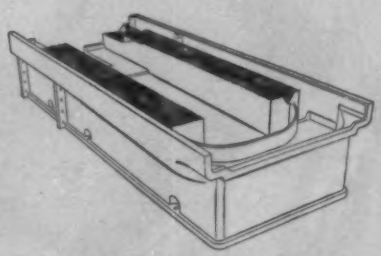
Field tests proved to us that there is up to five times less deflection in the box-type, one-piece column, bolted and keyed to the base. Thrust is *down* onto the table and *back* into the column. Only this equivalent of a one-piece "L"-shaped Meehanite casting will give you a machine that stays put under a real hogging cut. To you, this means less stock to remove during spark-out—the most inefficient part of the grinding cycle.



But there are other important features to look for in a column . . . and you find them in the Mattison Model 60. Our combination "V" and flat ways are wide, long, and deep. This eliminates cramping and permits smooth, precise downfeed under a light or a heavy load.

Separate coolant tank eliminates heat build-up

To minimize thermal expansion and vibration, we put plenty of Meehanite metal in the base . . . not coolant. Our heavy, double-walled base has uniform structural cross-ribbing to eliminate stress areas. This puts rigid support under the table. Both the bed and column are stress-relieved in a gas furnace.



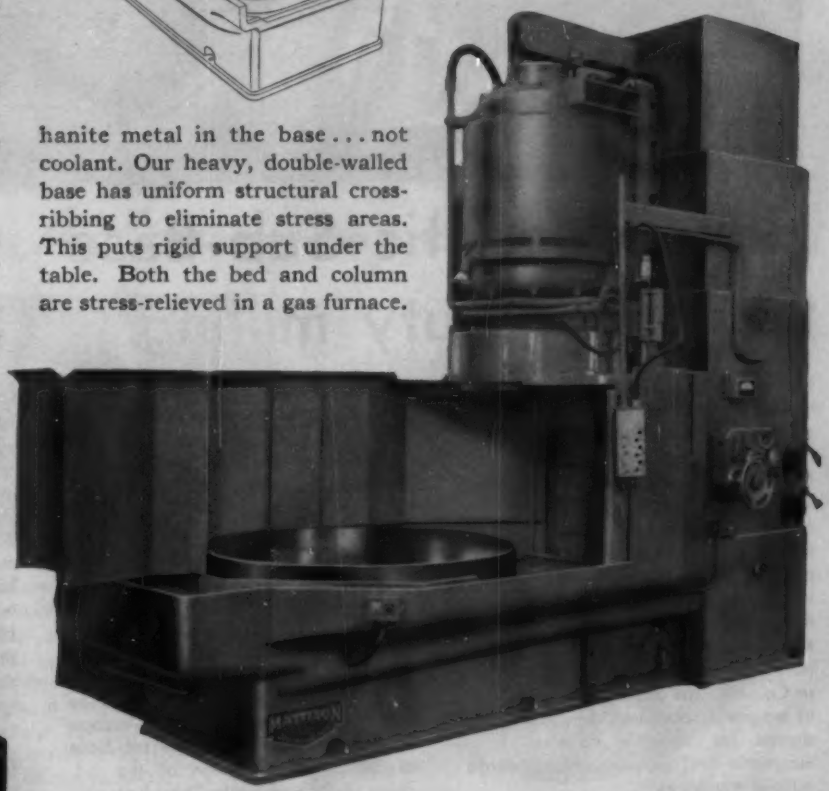
Completely guarded ways make accuracy last longer

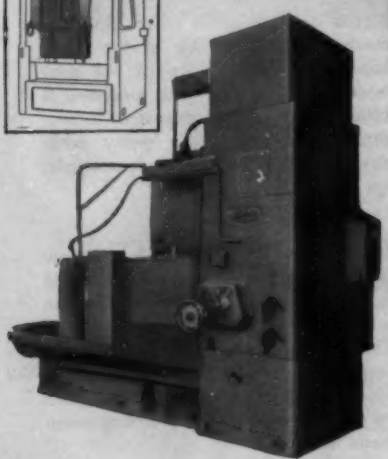
Large "V" and flat bed ways provide maximum weight-bearing surface. They are closely spaced to prevent carriage deflection.

In any position of the table or wheel head slide, ways of the bed and column are fully protected. A bellows-type guard covers the upper column ways. A telescoping steel guard protects the lower ways. Bed ways always are in full contact with the table carriage, giving you maximum protection and support.

Send for free literature

For complete information on how Mattison's high-powered surface grinding can increase *your* metal-removing production, contact your Mattison representative or write the factory direct for free literature describing the new Model 60.





If it's a flat surface, there's a Mattison to grind it!

MATTISON MACHINE WORKS

Rockford, Illinois

MATTISON MACHINE WORKS ROCKFORD, ILL. U.S.A.

New Magnetic Sub-Base for heavy duty milling

Daniel F. Gotha,
Chief Engineer
O.S. Walker Company, Inc.
Worcester, Massachusetts

The benefits of using modern cutting tools and new, high speed, more powerful milling machines are often limited to relatively few hours per day because of the time spent in loading, unloading and changing setups. This often raises the cost per hour of a machine to such a high point that purchase and replacement of obsolete equipment is postponed. To help the metalworking industry to minimize the down time of expensive heavy duty milling machines, the O.S. Walker Co., Inc. has developed a new line of magnetic sub-bases specifically designed for versatile holding, both magnetic and mechanical, on large milling machines.

The conclusion that the sub-base would have to be adaptable to both magnetic and mechanical holding was arrived at to eliminate the necessity of removing the magnetic sub-base when a part is not adaptable to magnetic holding. To achieve this end, the top plate is one piece steel construction with T-slots and planer stop holes for horizontal positioning and blocking. The one piece steel top also assures maximum strength and rigidity.

Special magnetic design

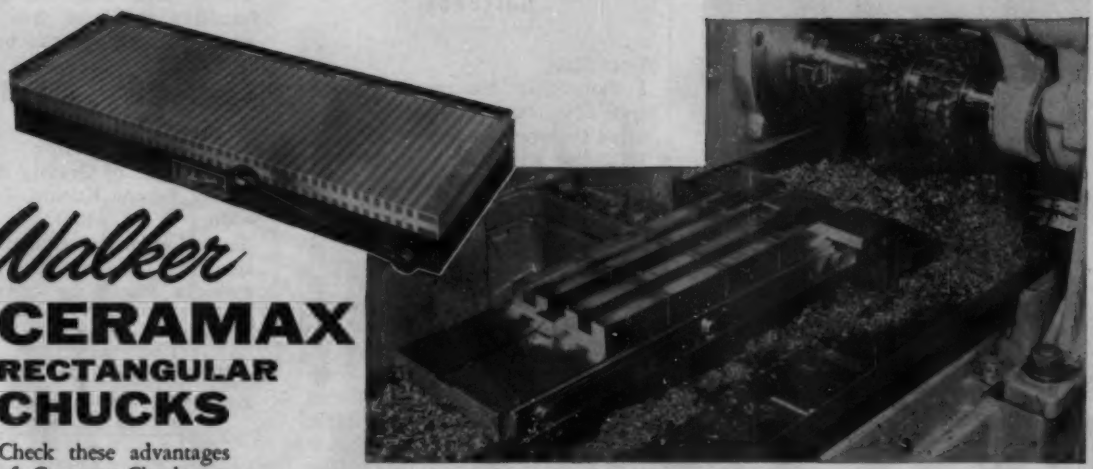
With the above thoughts in mind, our engineers at O.S. Walker Co., Inc., evolved a special magnetic design that produces an extremely powerful magnetic field yet is controlled so that magnetism does not escape through the bottom of the sub-base to cause magnetization of the machine table and ways. This eliminates one of the causes of excessive wear of ways, level screws, nuts.

The powerful magnetic field permits the use of raised blocks and shims to extend the use of magnetic holding to irregularly shaped work pieces. When working thinner pieces, such as textile loom sides, shims may be used to locate the work properly with reference to the sub-base top. Magnetic holding when used in this manner eliminates the distorting stresses to which the same work pieces are subjected when clamped mechanically. The use of the magnetic hold down force of the sub-base in conjunction with mechanical blocking to take up excessive lateral thrusts makes possible many time-saving setups not heretofore possible.

Low heat circuitry

In the new Walker sub-bases low heating is achieved through the use of a well-balanced circuit in conjunction with a low current electrical system. The I^2R power loss which causes heating is kept to a minimum by using a low current circuit which is designed to provide an extremely strong magnetic field.

for New Machines...



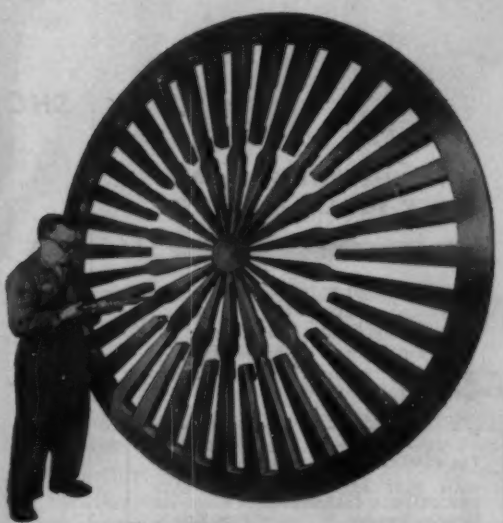
Walker CERAMAX RECTANGULAR CHUCKS

Check these advantages of Ceramax Chucks —

- Holding power extends to periphery of chuck.
- Silver brazed all-steel top plate.
- No magnetism imparted to work; chips and grit fall freely from work surface.
- No soft gap strips in which chips become imbedded — eliminates constant redressing.
- Three times coercive force of ordinary Alnico magnets.
- ¼" pole spacing.
- Low in height for greater machine capacity.
- Sizes from 4" x 4" to 12" x 24".

NO MATTER HOW COMPLEX YOUR PROBLEM

***Walker* has the know-how to solve it!**



Here are three typical instances of how O. S. Walker, can solve unusual problems for customers.

Above — A large three faced electro magnetic chuck measuring 13½" x 22" x 158" especially built for the knife grinding industry.

At right — A 96" diameter rotary auxiliary plate being prepared for production.

Above — An example of Walker engineered demagnetization — a special Saturable Reactor Control Demagnetizer for ball bearings.

O.S.Walker

O. S. WALKER CO. INC., WORCESTER, MASS.

Original Designers & Builders of Magnetic Chucks,

How to cut a keyway in 1 minute with a *Minute Man* keyway broach kit

MINUTE MAN KEYWAY BROACH KITS come complete with broaches, bushings and keystock. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

1. Select the right size bushing for the bore (sizes are plainly marked).

2. Insert the right size broach in the bushing slot.

3. Place under an arbor press and press through.

SAVE TIME WITH STANDARD STOCK SQUARE BROACHES

Starting with a round pilot you can finish an accurate square hole in one pass in less than one minute. For 1/8" to 3/4" holes. Hexagon and round broaches also available.

The duMONT CORP., Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square, Round and Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

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Company.....

Address.....

duMONT

LETTERS

to the editors

330 W 42nd St, New York 36, NY

Cartoons

Dear Sirs:

I thoroughly disapprove of the type of cartoon which your magazine features lately. While it may be in line with your new title and a departure from the old one, these cartoons are more vicious and baiting than humorous or good-natured.

I don't see any justification for your arrogance in which you try to show just how lazy and disinterested labor is in your eyes . . . I don't expect to see these comments in your "Letters" column because I'm not patting your back.

H Landanor
Tampa, Fla

We can assure Reader Landanor that there is no intention to pick on anyone in our cartoons. The magazine is read by heads of companies and by employees, and we consider both fair game for a gag.

The cartoons exist purely to lighten our rather heavy technical material. Other comments that we received about them have been almost universally complimentary; that's why they have not appeared in this column. We would rather use the space for handling problems than for unnecessary pats on the back—Ed.

Correction—C G of Dies

Dear Sirs:

Re: "Center of Gravity of Dies—II" by Ferenc Kuchta, (AM/MM —July 11 '60, p137).

Several errors have been found in the formulas given. The principal formula should be corrected to read:

$$Y_o = \frac{S_1 Y_1 + S_2 Y_2}{S_1 + S_2}$$

and $Y_1 = C + B/2$

And in the example given:

$$Y_o = \frac{3 \times 2.375 + 2 \times 1}{3 + 2} = \frac{9\frac{1}{8}}{5}$$

$$Y_o = 1.825$$

C D B Agnew
Division Staff Supervisor
Trades Training Dept, Steam Div,
Westinghouse Electric Corp,
Philadelphia

They've Moved

Dear Sirs:

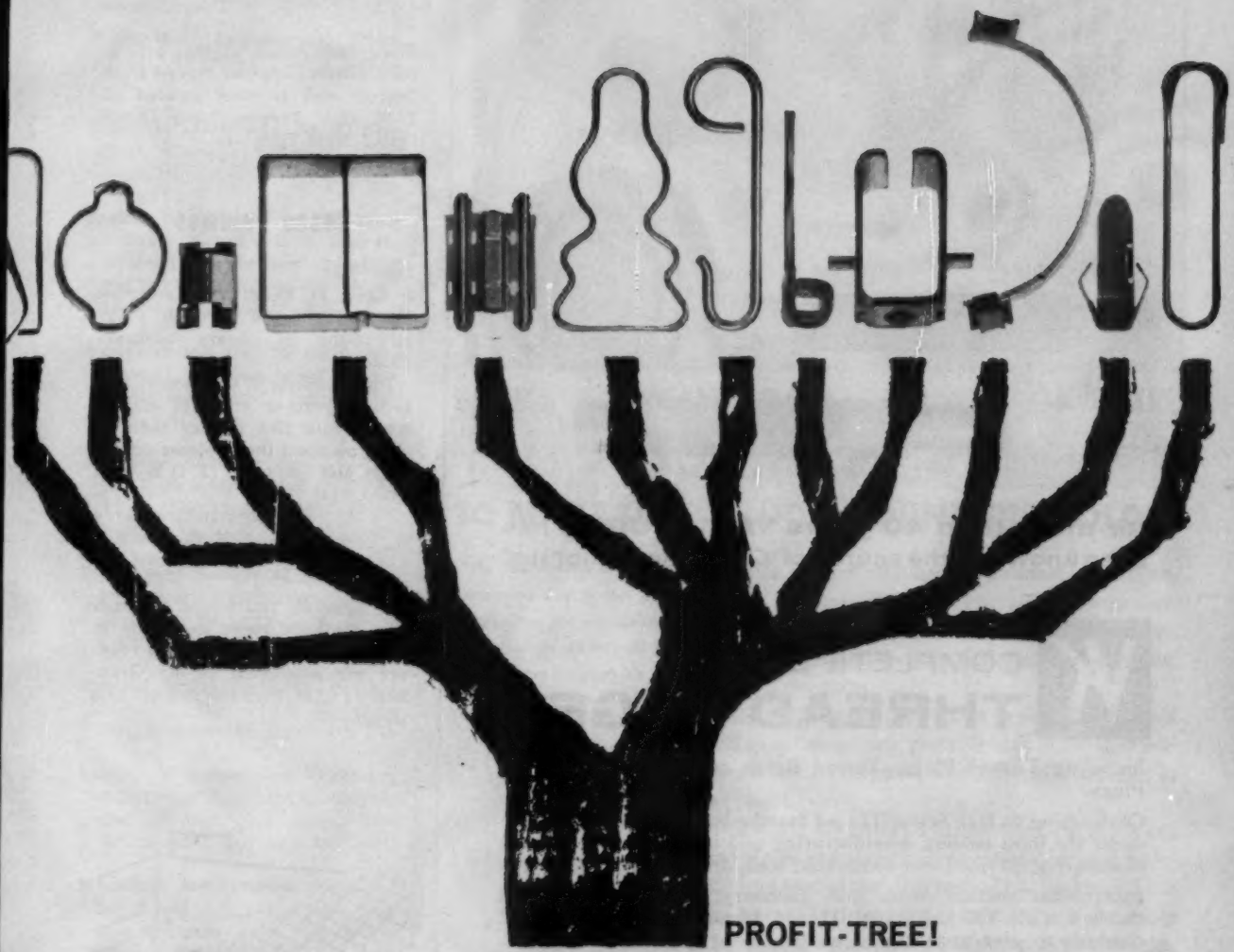
We wish to inquire about the static switch that we read about in your publication (*AM/MM* — July 27 '60, p99).

SHOPMATES

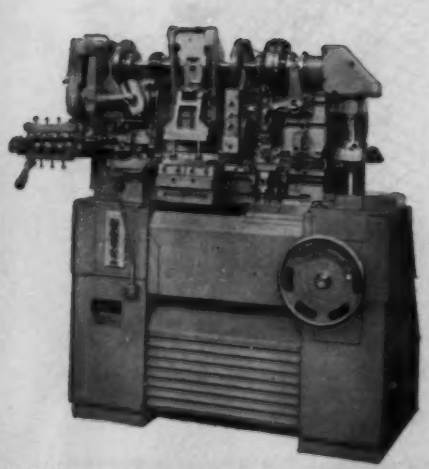
N. Jarvis

—A THREE ?? I TOOK IT FER A FIVE OR A TWO ....
HEY!! ALF!! TAKE A LIGHT OUTSIDE AN' SHINE IT THROUGH HERE!!
WHY DON'T THEY GET A NEW PRINT??
THEY'D ALL HAVE TO GET BACK TO WORK IF THEY DID THAT!
—NOPE—IT'S A—IT'S A—LOOKS LIKE NINE!
N. JARVIS

THESE PARTS ARE BEING PRODUCED AT SPEEDS OF 90 TO 250 PCS/MIN



PROFIT-TREE!



These are formed parts produced in single automatic operations on the revolutionary new Torrington Vertical 4-Slide.

With precision and speed, the Verti-Slide has replaced as many as five and six progressively tooled presses in the production of a complex part. Normal secondary operations such as welding are being done in one continuous automatic operation in excess of 100 pcs/min.

If you make or buy complex wire or strip parts, the Verti-Slide method offers dramatic reductions in production cost. Less parts handling, in process inventory, machine space—all mean greater profits to you.

Write or call for field technical data or a Torrington Sales Engineer.

THE TORRINGTON MANUFACTURING COMPANY

MACHINE DIVISION Torrington, Connecticut

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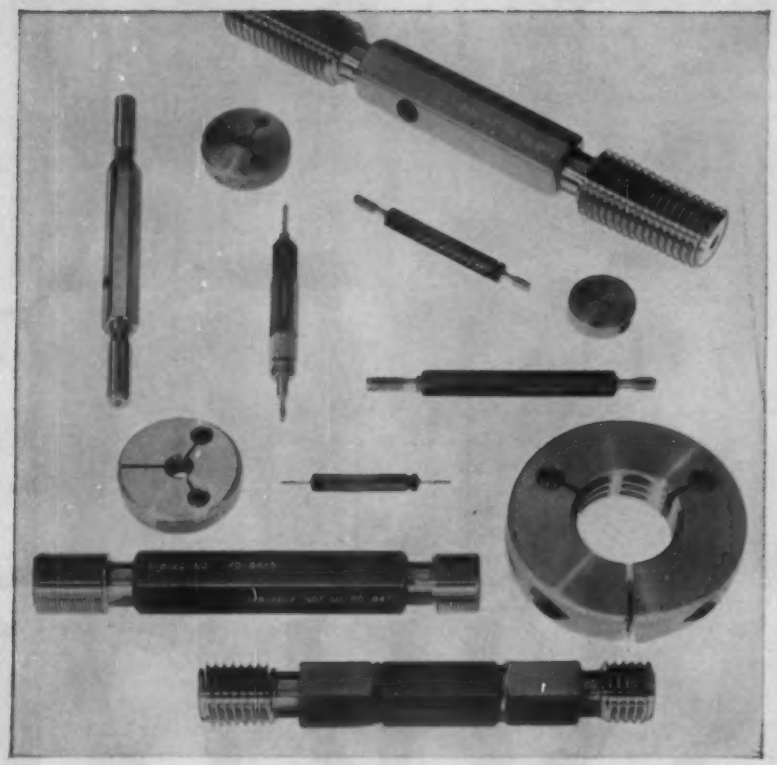


for more than 40 years VAN KEUREN has been known as the source of 'Quality in Millionths'

VK presents a
COMPLETE LINE of
THREAD GAGES

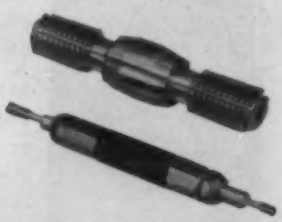
including Thread Plugs, Thread Rings and Truncated Setting Plugs.

Conforming to H28 Screw Thread Standards, these gages are made under the most modern manufacturing and inspection facilities . . . eliminating all questions about size, lead, drunkenness, and angle.

Exceptional surface finish and geometry; — pitch diameters checked with VK Calibrated Thread Measuring Wires . . . all combine to give unparalleled quality. *Long gage life is assured.*

Send for new catalog 36B

VK originated the reversible plain plug gage. Here's another first, a new design in Reversible Thread Gages with these superior features: lapped center holes, both ends • Fit standard AGD handles • No bushing necessary • Center holes permit accurate lead check • Priced the same as ordinary Reversible Thread Gages.



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PRECISION MEASURING TOOLS
. . . rated the world's most accurate

Plug Gages • Measuring Wires • Optical Flats and Light Wave Equipment • Gage Blocks
Precision Lapping Service and Parts

We have written Ovitron Corp, Detroit 27, Mich, but we have not obtained any response from them. We shall be much obliged if you kindly tell us the accurate name and address of the above-mentioned firm.

K Nakajima, *deputy mgr*
Machinery Dept A
Marubeni-Iida Co, Ltd
Tokyo, Japan

Since publication of this article, the Ovitron Corp has moved from Detroit and is now located at 37-05 48th Avenue, Long Island City 1, New York—Ed.

Bound Volumes

Dear Sirs:
I have 11 years of AMERICAN MACHINIST (1944 through 1954) all bound in library buckram (blue).

Please advise if you would like to buy them or know of anyone who would like to buy them.

If you want them, please advise what you can offer (F O B West Point, Ga).

Herman Granberry
1207 Fourth Ave
West Point, Ga

We have all the bound volumes that we have room to handle in our offices. However, if any readers are interested in Mr Granberry's offer, they can contact him direct—Ed.

"He told me that every four months my salary would be adjusted, but I thought he meant upward."

CALENDAR

American Machine Tool Distributors Association—Annual Meeting, Sept 3-4, La Salle Hotel, Chicago, Ill.

National Machine Tool Builders Association—Machine Tool Exposition, Sept 6-16, International Amphitheatre, Chicago, Ill.

Production Engineering Show, Sept 6-16, Navy Pier, Chicago, Ill.

Coliseum Machinery Show, Sept 7-15, Chicago Coliseum, Chicago, Ill.

Society of Automotive Engineers—Farm, Construction, and Industrial Machinery Meeting, Sept 12-15, Milwaukee Auditorium, Milwaukee, Wis.

American Die Casting Institute—Annual Meeting, Sept 14-15, Edgewater Beach Hotel, Chicago, Ill.

American Welding Society—National Fall Meeting, Sept 26-30, Penn Sheraton Hotel, Pittsburgh, Pa.

Instrument Society of America—Instrument-Automation Conference & Exhibit, Sept 26-30, Coliseum, New York, NY.

Pressed Metal Institute—Annual Meeting, Oct 10-14, Shawnee Inn, Shawnee on Delaware, Pa.

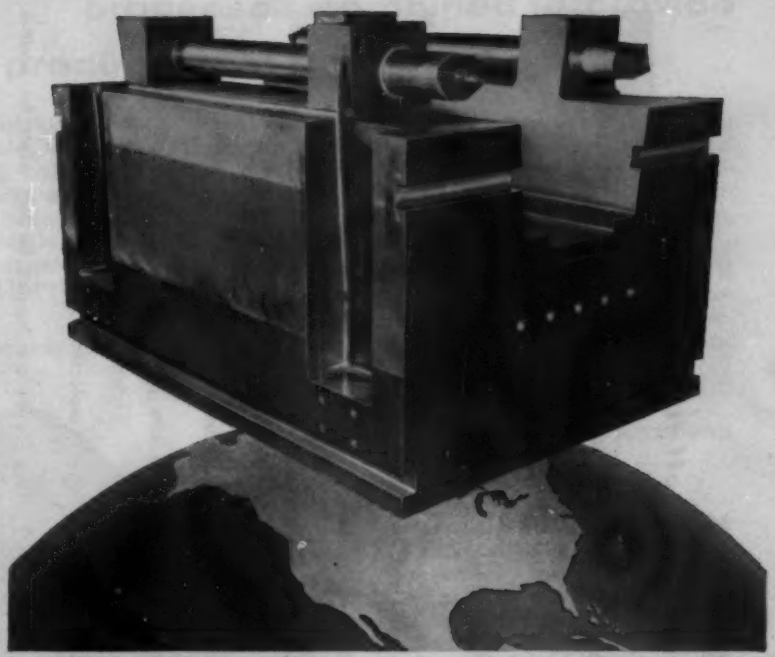
Society of Automotive Engineers—National Aeronautic Meeting and Display, Oct 10-14, The Ambassador, Los Angeles, Calif.

Industrial Management Society—Industrial Engineering and Management Clinic, Oct 13-14, Conrad Hilton Hotel, Chicago, Ill.

National Safety Council—National Safety Congress, Oct 17-21, Conrad Hilton Hotel, Chicago, Ill.

American Society for Metals—National Metal Exposition and Congress, Oct 17-21, Trade and Convention Center, Philadelphia, Penna.

National Tool & Die Manufacturers Association—Annual Convention, Oct 19-23, Leamington Hotel, Minneapolis, Minn.



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35 MILES UP*

TO MAKE THIS 36,000 POUND DIE HOLDER

*The Finkl Process of vacuum degassing steel in the ladle duplicates the atmosphere found at an altitude of 35 miles above the earth.

In this rarefied atmosphere, unwanted hydrogen, oxygen, non-metallic inclusions, and other impurities are literally boiled out of the molten steel, producing cleaner, tougher, stronger, more ductile, flaw-free products.

This 36,000 pound, 40" x 44" x 64" die holder is used in a heavy duty press. It was made of Finkl FX analysis, Temper 4, and finished machined in our shops.

All Finkl die blocks and hot work die steels are made from vacuum degassed electric furnace material produced in our own melt shop. Because of the clean, greatly improved qualities, you get more forging production, less downtime due to breakage, and savings in fewer tool regrinds.

You get more from Finkl in quality, continuing research, and engineering service. Call your Finkl representative for your forging, hot work die steel, and die block needs.

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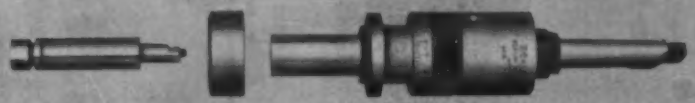
BOKUMATIC® RECESS TOOL HOLDERS

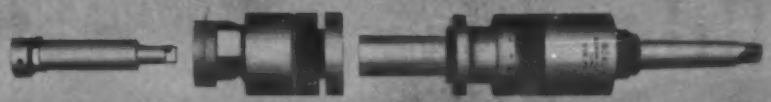
quick change feature permits you to work off fixture—off part

How it Works

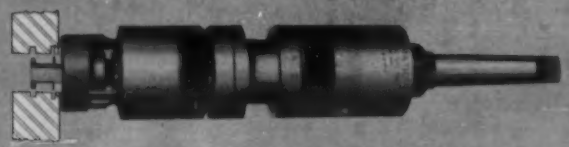
1. Standard Model B holder with quick change adapter and pilot to fit in bushing plate assembly.



2. Remove quick-change adapter and thrust bearing.



3. Replace with thrust bearing-pilot combination and Model B-1 quick change adapter.



4. Standard Model B-1 holder and quick change adapter and pilot to work off part.

LOOK at these plus-value advantages

- Only recess tool holder available with quick-change adapter.
- Holder convertible to off-center style for deeper recessing by changing to off-center type adapters.
- Holder uses straight shank cutting tools, reducing cost of perishable tools.
- Specially designed taper collet holds cutting tool in place. Holder can be used either vertically or horizontally.
- Holder convertible from jig fixture piloting to work piece piloting.
- Holder actuated by two cam pins 180° apart for smooth chatter-free recessing.
- Cam pins accessible for easy replacement.
- Replaceable tool holder shanks are located by two pilots for positive concentricity.
- Circular tools can be used since holder actuates cutting tool in special radial path.
- Cutting tool can be preset in quick-change adapter as to depth into part before tool holder is assembled.

Write today for catalog BO-1-60

BOKUM TOOL COMPANY, INC.

TRADE MARK REG. U.S. PAT. OFF.

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Two advanced -Verson- processes combined to provide more efficient production of machined parts.

In a perfect blending of two of metalworking's most efficient production processes, Verson has developed the Transmat-Impact Machining Press. It utilizes the Transmat principle of mechanical fingers to move the piece part from one station to the next. It also utilizes the cold extrusion principle of Impact Machining to form in two strokes of the press a part that previously had to be machined from a piece of solid bar stock by metal removal processes.

The part formed is the master cylinder for automotive brake systems. One Transmat-Impact Machining Press produces them at the rate of 30 per minute and replaces a bank of automatic screw machines. Material consumption is reduced by 47%. Impact Machining completely finishes the bore, ready for installation, and produces a significantly stronger part.

If you produce machined parts in quantity, you owe it to yourself to investigate Impact Machining and Transmat-Impact Machining. For full information and recommendations, send an outline of your requirements.

TRANSMAT PROCESS PLUS IMPACT MACHINING EQUALS LOWER COST.

The Impact Machining Press illustrated has a capacity of 300 tons. 30 parts per minute are produced. Area of slide and bolster is 36″ x 54″. The hopper feed is synchronized to supply slugs as needed.

-Verson-

See Metalworking's most advanced production processes in action at the Verson factory, September 6-16.

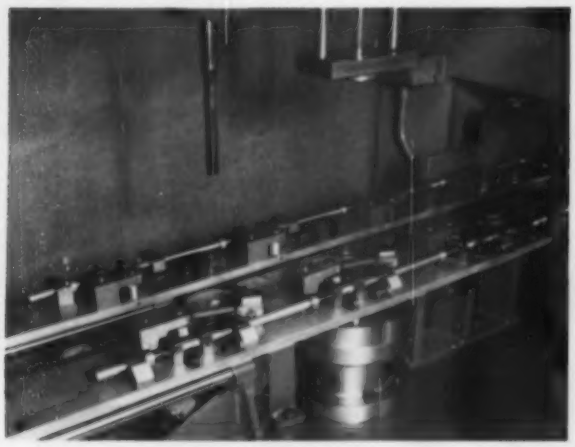
MORE! Turn the page, please . . .

AT -Verson- THE PROCESS IS MORE IMPORTANT THAN THE PRESS

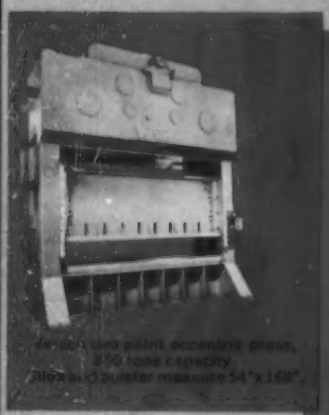
TRANSMAT FORMING, originated and pioneered by Verson, utilizes synchronized mechanical fingers to move the piece-part from one station to the next fully automatically. Below is a close-up of the die space of the press shown on the reverse side of this page. Mechanical fingers pick up the slug and move it into position for the first operation. At the completion of that operation the fingers move it for the second operation and then to discharge. Transmat forming may be used for a wide variety of formed and drawn parts, as well as for Impact Machined parts. Production rates run as high as 2880 pieces per hour. Draws as deep as 10" have been made by the Transmat process.

IMPACT MACHINING, a Verson development, is the cold working of steel and other metals by applying pressure with formed tools to create plastic flow. By producing in a press parts that would normally be made by forging or metal removal processes it is often possible to use lower cost materials . . . to reduce material consumption . . . to reduce machining requirements and to reduce materials handling costs.

Shown below are the various stages in the Impact Machining of the automotive master brake cylinder described on the reverse side of this page. The process starts with a coated slug; two press strokes form the part. A simple trimming operation completes it.



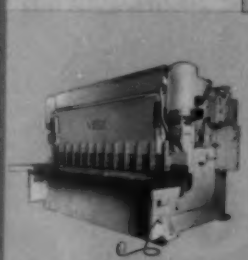
OTHER VERSON PRODUCTION PROCESSES ARE BUILT AROUND PRESSES LIKE THESE



Verson two point eccentric press, 300 tons capacity. Bed and bolster measure 54"x168".

Verson No. 10-F O.B.I. rated at 215 tons normal operating tonnage, 250 tons maximum operating tonnage; equipped with optional flanged slide.

Typical straight side hydraulic press. This model has a capacity of 800 tons.



Model HS-750-12 shear with a capacity of ¾"x12'.

Verson Press Brakes are made in a complete range of sizes and types for all requirements.

See Metalworking's most advanced production processes in action at the Verson factory, Sept. 6–16.

IMPACT MACHINING • MOVING BOLSTER PRESSES • DUAL SPEED PRESS BRAKES • COLD EXTRUSION • TRANSMAT FORMING • DOUBLE ACTION PRESSES

Verson

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SPOT NEWS...

- **Much higher drilling speeds** are available on new models of the Buffalo Forge Co's hollow-spindle drilling machines. Variable speed range is from 500 to 2000 rpm, nearly double that of previous models. With these speeds, the machine (called the RPMster) can easily handle the super-hard exotic metals and cermets. A principal feature of the machine is the use of a timing belt instead of the conventional V-belt drive; the timing belt reportedly eliminates belt slippage and "take-up."

- **An upright drilling machine** developed by Giddings & Lewis represents the first unit in a new standard line for more accurate drilling—and possibly N/C later on. The 30-in. unit has 10 hp and wide span of spindle speeds and feed rates. The elevating table can be replaced by a compound table if required.

- **Small shops that need big machining capacity** may like Rockford's 72-in. hydraulic openside planer equipped with a templet duplicator or milling head. It has a 15-hp drive for DC feeds up to 100 ipm. Milling-head speeds are 50-1200 rpm. This head and the standard rail head are interchangeable on a common swivel saddle.

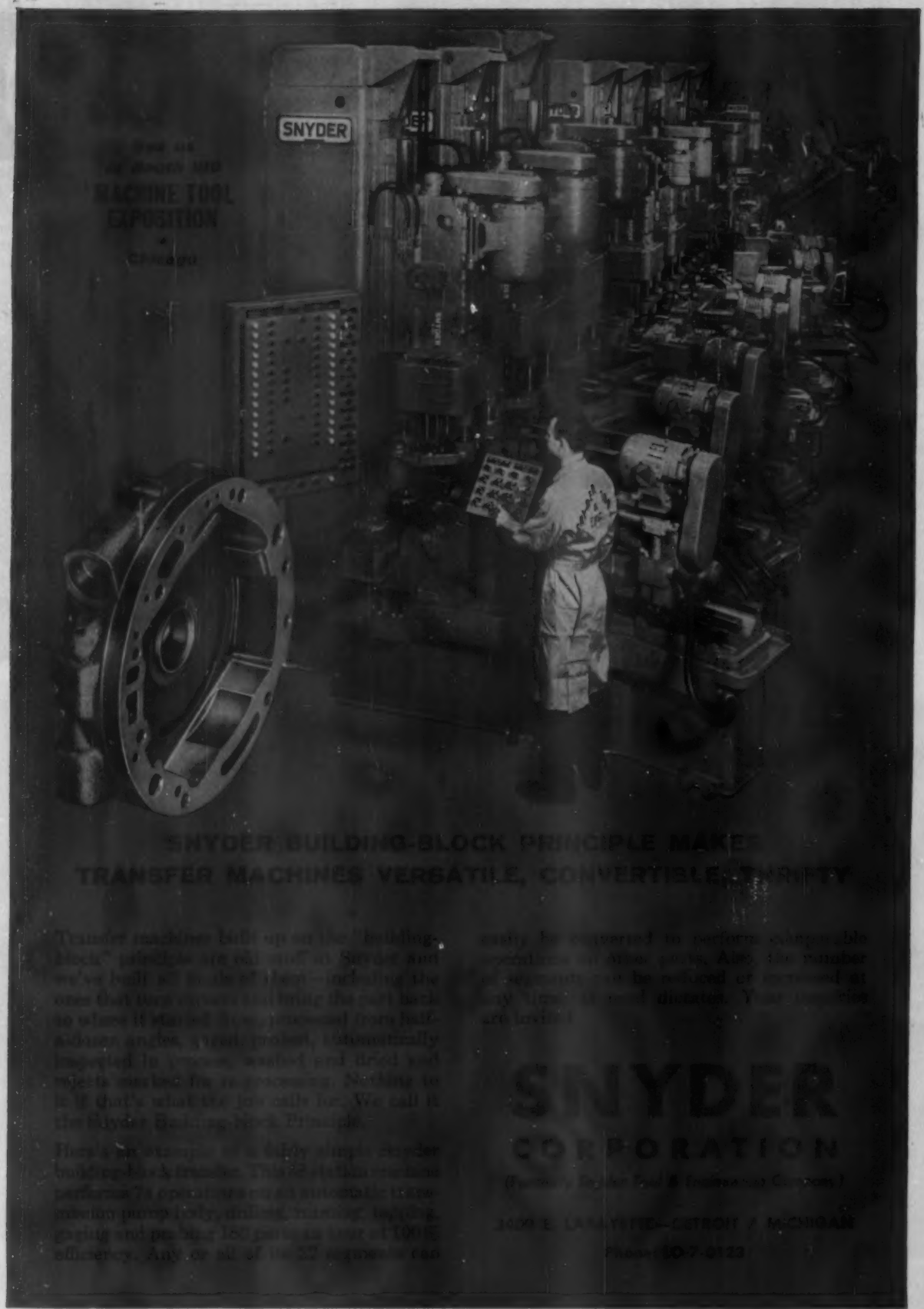
- **Meehanite frames are an important feature** of a new series of Bliss inclinable presses. Four tonnages—22, 35, 45, and 60—have these cast frames, which are said to reduce deflection at full tonnage, permit increased dimensions in bed and die areas, and also permit heavier design of load bearing working parts. Called the Big "C" series, the line also comes with a portable inclining device that will serve a whole battery of presses, eliminating need for a separate unit at each press.

- **A convertible for the shop**—a Cleveland 3-in. AB automatic bar machine—can be changed over for chucking operations with a simple attachment that takes only 30 minutes to install. At the show it will be chucking; though primarily it is a bar machine.

- **The high-horsepower trend** keeps going on; now Mattison has a big rotary surface grinder with 125 hp (or less if desired). The machine has a 48-in. table and heavy box frame for high rates of stock removal. Electrical power tilting is a feature that permits fast roughing until the surface is within a few thousandths of final dimension; then a switch is flipped to power the wheel back to dead flat for final finishing.

- **Building-block principles** have applied mainly to the elements that go into transfer and other complex machines. Motch & Merryweather has announced a building-block program that applies only to vertical turning machines; bases, columns, heads, and slides. Actually, the line of machines is cataloged like a regular line; the building-block advantages are particularly for the customer who wants a change in machine capability or capacity, and can add a unit or two without completely and permanently changing the basic unit.

- **Fast cycling, but slow, controlled bending,** is the feature of a 10-ft automatic Cincinnati press brake designed for smooth bending on light-gage metal over small die openings. The machine has two stroke speeds, 30 and 7/min, and dual air-electric clutches. The object of careful bending control is smooth power to prevent back bends and "whip-up."


SNYDER

WASHINGTON...

Federal aid program bogged down...

Washington can show little if any progress in the six months since Leo A Hoegh, Director of Civil and Defense Mobilization, announced his highly-touted four-part program to "determine how to strengthen" the machine-tool industry. The overall effort has become a case study in bureaucratic foot-dragging.

Hoegh's plan was disclosed shortly after NMTBA submitted a paper to OCDM reporting that "the industry was concerned with the growing threat to the national security arising out of the relative growth of the machine-tool industries in Russia and other foreign countries as compared to the growth of the domestic industry." NMTBA said "this growth in the foreign industries has resulted in increased imports, the decline of the export market, and the movement of the U S machine-tool capacity abroad."

In effect, NMTBA was telling Washington this: The machine-tool industry is in the doldrums; if the government considers the industry essential to the defense of the nation it should come up with a plan to assist the producers. One idea on the mind of some of the tool builders: import restrictions.

Hoegh's agency, representing the overall Eisenhower administration view, agreed that the machine tool industry is a key element of national strength. But it discouraged the industry's interest in import restriction and proposed an alternative program.

Why plants don't modernize . . .

The major point in Hoegh's plan was to be a comprehensive survey of why privately-owned U S metalworking plants fail to modernize production equipment at a faster tempo.

At first, the survey was to be made by the Commerce Department. But last month, the Department was authorized to hire Arthur D Little, Inc, noted Cambridge, Mass, research firm, to make the survey.

A questionaire to go out to a representative sampling of metalworking plants is now being prepared. The plants will be asked to state frankly why they hold back on investing in new tools.

Some government officials close to the machine-tool scene claim depreciation is not the key to accelerating industry investment in new tools. They point to other factors affecting a company's decision to buy or not to buy new production equipment: Labor-union resistance, corporate organization and its relation to tool modernization, the effect of corporate dividend-payment policy on machine-tool purchasing, etc.

Import-export study on tools . . .

A second element in Hoegh's plan was a Commerce Department study on means to boost U S machine-tool exports and an analysis of "the degree to which foreign suppliers may be engaging in market manipulation practices in the U. S."

This study is now being completed. But officials are reluctant to discuss the findings until the formal report is ready.

Final points in Hoegh's plan . . .

Hoegh also proposed (1) a Budget Bureau drive to emphasize to all government agencies which own tools how production savings can be achieved through modernization of equipment in use; and (2) a Small Business Administration legislative proposal to provide for guaranteed loans for equipment modernization.

Since then the Budget Bureau has turned cool toward the idea and is steering clear of becoming involved. SBA, meantime, says it already has legislative authority to make facility modernization loans.

Treasury survey of depreciation . . .

Treasury Department has begun an investigation of industry's tax depreciation policies (AM/MM —Jul 11 '60, p87). Some 6000 firms are being covered. Purpose is to get a sharper view on the depreciation practices of business than is obtainable in routine tax returns, and to explore the possibility of adopting new amortization rules.

Companies must complete questionnaires by Sept. 1. Replies are being kept confidential, with only statistical compilations to be released when the returns are processed.

Treasury wants to learn to what extent companies have changed their amortization schedules to take advantage of the depraciation liberalization approved in the 1954 tax law overhaul. The new law allowed companies to take the double-declining balance formula and the sum-of-the-digits methods, both of which permit much larger annual deductions during the early years of the life of a piece of equipment than is taken under the straight-line method.

A preliminary study of 1957 corporate returns showed that 80% of the corporate tax payers still used the straight-line method.

and now...

BULLARD DYNAMILL*

First fully Power-Controlled H.B.M

The Dynamill* H.B.M. uses Bullard's new Dynamic Precision Control System to increase productivity of the machine and quality of the work.

Dynamill* now brings the work and tool together in the shortest possible time.

These features on the new Bullard Dynamill* H.B.M. provide optimum productivity:

- **Simple push button pendant control**
- **Easy-to-read clock type positioning dials**
- **Four traverse rates including creep**
- **Infinitely variable feed rates which can be changed while the tool is in the cut.**

Simple push button pendant controls and clock-type positioning dials accurately locate head, table, saddle, and spindle.

Available in 3, 4 and 5 inch spindle sizes, four standard head post heights, five table sizes and five bed lengths.

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HI-LITE FEATURES OF THE DYNAMILL* H.B.M.

POWER CONTROLLED Simple pendant controls start, stop and speed of spindle as well as all directional movements of head, table, saddle and spindle. Large, easy to read clock-type dials show exact position of work in relation to tool. Infinitely variable feed rates and four traverse speed rates. Power Draw Bar for fast and easy tool change. Fully automatic hydraulic binders for head, table and saddle.

VERSATILE Saddle stops allow rapid traversing of saddle to pre-determined positions. Depth-A-Trol* provides accurate spindle depth Control. Modified Mark 1 Tape Control for head and table positioning. Continuous feed facing attachments with infinitely variable feeds. Right-angle milling, thread cutting and contouring attachments. Built-in or auxiliary tables.

COMPACT AND RUGGED The new Bullard Dynamill* H.B.M. is compact in design — lower in overall height — requiring less floor space, yet has more built-in rigidity and durability.

EASY MAINTENANCE Automatic lubrication throughout — fewer parts — fewer adjustments — easily accessible.

"YOU CAN'T BEAT A BULLARD"

DETROIT...

That perfect machine...

Detroit, forced by principle into the delightful situation of having to cut $2-5 million off an annual tooling expenditure of 100 times that figure, has of late become seriously critical of research efforts in the machine-tool industry.

Chrysler's L B Bornhauser, group executive for power train manufacturing, indicates most interest in new forms of chipless production. By hindsight, he feels that these techniques "should be much further advanced today" than they are.

Chrysler's most recent purchases in this area are two Intraform machines for use in the manufacture of starter clutches. These replaced gear shapers and broaches. Chrysler is already using electrostatic discharge machines to barber dies.

The company is definitely in the market (and says this safely in the knowledge that nothing is presently available) for a machine that will cold-roll planet pinion gears. Shaping and shaving can be accomplished in this manner now, but current techniques still require additional finishing operations.

Bornhauser admits that, to some extent, Chrysler interest in rebuilt machinery is a matter of immediate economy. Surprisingly, he notes that no definitive study has been made to determine the point at which sacrifice in technology becomes unecenomical.

Another factor undoubtedly influencing the decision to rebuild rather than buy is that used transfer lines are, as Bornhauser puts it, "dogs to move." For example, Packard's multi-million dollar block line for V-8 engines, used for barely three years, is still sitting in dust covers.

Future of grey iron...

GM's Darl Caris months ago bluntly told the Grey Iron Founders Association that "aluminum castings are now competitive with iron from a cost standpoint." Though forward-looking automakers tend to look at grey iron foundries as "antiquated activities," they are actively pursuing the goal of cutting wall thicknesses in half.

Chrysler is bullish about a new core binder it has developed, compounded from urea resin and furfurol alcohol. Experimental cores have already shown a 25% reduction in wall thicknesses with a high degree of dimensional accuracy.

Automatic assembly...

Reaction to the future of automatic assembly in the auto industry is mixed. Ford has successfully worked out procedures for smaller components such as oil pumps, rocker arms, pistons and connecting rods.

A spokesman reports progress with machines that will cope with components, such as connecting rods, that vary slightly in dimensions, model for model.

Chrysler is somewhat sour on automatic assembly. It had a notable failure with a machine that was to assemble brakes. As Bornhauser explains it, the machine did not have the flexibility to accommodate minor design changes. The feed mechanism in particular was predicated upon too close tolerances. Current Chrysler interest lies in semi-automatic assembly.

Specific gripes...

Automakers are unanimous in criticizing lack of research in expendable tools. These, they feel, should be married to the machine, but, to date, no Cupid has stepped forward.

They ask for special machine tools with more capability of maintaining print tolerances, day in and day out. They would like to see automatic tool changers. They note that spurts of research occur in the machine-tool industry only in bad years. One source voiced a plea for more interchangeability in transfer machine stations.

New materials...

It is a rule of thumb in the auto industry that no material is considered just because it is new. Magnesium, for example, is still judged as a "promotional" material. Its weight-saving potential on non-stressed parts has been proved, but the biggest worry is the precautions that must be observed in machining. One would think that the hazards of dry-grinding magnesium would be common knowledge, yet Chrysler recently lost one of its suppliers through a magnesium explosion.

New processes...

Probably the next big industry announcement will be a break through in Kellering, where engineers can work directly from the stylists clay. An averaging device will sweeten variations in the clay surface—***Don MacDonald***

MACHINES DESIGNED WITH THE FUTURE IN MIND.

PRODUCTION MACHINERY
GREENLEE

- Special Purpose Machines
- Transfer-Type Processing Machines
- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines
- Trim Presses
- Woodworking Machines and Tools
- Hydraulic and Hand Tools

COOPERATIVE TEAMWORK MAKES THE DIFFERENCE

Through every phase of the construction of a Greenlee transfer machine, Greenlee engineers maintain a close contact with you, the customer. They are strong on the buyer's viewpoint . . . know what cost-conscious management wants. They stay on the job from the time of initial planning until your machine is operating at full efficiency. This last phase—the proving out period—is especially important. Greenlee men are extremely helpful in bringing your machine up to full production . . . training your operators to keep it producing profitably. Call Greenlee. Let them show you how cooperative teamwork can benefit you.

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M. J.—better call these people on the special boring machine for that aluminum casting Al.

AIRCRAFT and MISSILES...

TRENDS

New machine tools needed...

Aircraft and missile builders urgently need new machine tools. The relatively recent switch from aluminum to steel for supersonic plane components and missile parts has left the builders with what amounts to obsolete equipment.

The industry is in a transition period in which it uses fewer and fewer conventional materials and processes, and more and more superalloys and supersteels.

No one in the aerospace industry believes that modern planes and missiles can be made with maximum efficiency on existing equipment. The need is for bigger, more rigid, more powerful machine tools. And they must be high-capacity, multi-purpose machines which can easily meet changes in vehicle design and improvements in manufacturing methods.

The industry's immediate concern...

Immediate concern is for lathes and other standard machines, including furnaces, capable of handling missile components of 10 to 30 feet in length with diameters of about 8 feet.

Heavy shears and rolls with capacities for ½-in.-thick material up to 15 feet long are also needed as are millers in sizes No. 5 and No. 6.

But future manufacturing needs will call for machines capable of handling parts up to 70 feet long, 30 feet in diameter, in materials ¾ in. thick. Boring mills, lathes, vertical turret lathes, gantry mills, boom and gantry welders, forming brakes, shears, rolls, cranes, and furnaces will be needed.

Today's all-purpose machine tools have broad ranges of speeds and feeds, with the higher ranges available for machining aluminum and other nonferrous alloys, and the lower ranges for steel and the tougher alloys.

But now the missile and aircraft builders want more selectivity in the lower range of speeds and feeds, to accommodate the sensitivity of the new alloys.

But the most urgent need is for rigidity—not only for machining heavy ground support equipment. Many existing machine tools lack the rigidity and accuracy for this work.

One firm, for example, is using heavy-duty chucking machines, not for the high-volume jobs for which they are intended, but for the rigidity they provide in holding tenths in machining steel parts. Bigger, more powerful presses are also required.

Several manufacturing people speak of the need for bigger presses in high-pressure rubber-pad forming, for example. They'd like to see presses developing 7000 to 12,000 psi that would be large enough to take much bigger sections than can now be handled.

Others are investigating the use of presses to preform blanks for shear forming.

In general, however, the aircraft and missile builders want presses with greater strokes, higher tonnage, and better controls.

Some expressed interest in sensing devices capable of determining the degree of elongation reached at any point in forming a particular material, so that the forming cycle can be controlled to eliminate fractures. With blanks now costing as much as $2000 to $3000 each, little or no scrap can be tolerated.

Another field of interest is shear forming. The basic process is in widespread use, and modifications such as roll extrusion, reverse shear forming, and hot shear forming are being applied as new problems are encountered.

Numerical control...

Numerical control has already been applied in basic machining, welding, riveting, and press-working. But there is still a long way to go.

One user is looking for a system that can machine right-and left-hand parts without reprogramming. [There's at least one such system at the Machine Tool Exposition.] Another user is interested in systems capable of shifting the angular placement of the machining pattern to any quadrant.

A numerical control feedback loop that would take information from a point as close to the work as possible—preferably right at the tool where the chip is produced, rather than at the leadscrew as in most existing systems—would permit the machine control unit to compensate for deflection in the ways, the spindle, and actually in the tool itself.

Newer processes are promising...

Many new processes are being watched closely by manufacturing engineers in the aircraft and missile industry. Many of them are already using explosive forming, chemical milling, electrolytic grinding, electrical discharge machining, and ultrasonic inspection, machining and welding. Even more recently, they've been looking into chipless machining, electron-beam welding and machining, plasma-jet welding, and other high-energy-rate processes.

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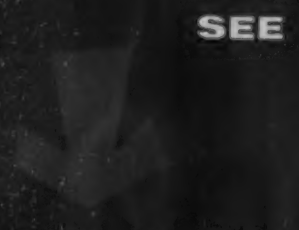


ASK ABOUT THE NEW CUSHMAN SPECIAL CHUCK BOOK
Describing and illustrating special chucks engineered to meet specific workholding problems.

SEE

- Two-Jaw INDEX CHUCK, industry's first, designed and engineered to holding bottle molds, gate and globe valve castings for precision machining and elimination of multiple chucking operations
- SPLIT RING CHUCK enables internal centering and holding of large, thin wall tubing without distortion
- INCREASED CAPACITY CHUCK FOR AUTOMATICS featuring small diameter, large bore capacity and an unusually high lever ratio
- HIGH SPEED ROTATING AIR CYLINDERS
- POWER WRENCHES AND CHUCKS featuring controlled wrenching torque; eliminates laborious hand wrenching and operator fatigue
- CUSHMAN AIR and MANUALLY OPERATED CHUCKS —a world standard for precision, performance and longevity

MACHINE TOOLS...

Romi to make 5000 lathes yearly . . .

Giordani Romi, Brazilian machine tool builder, is now producing his small MIM engine lathe at his Sao Paulo plant in 200 manhours, which matches the Soviet claim for production time of a lathe at its Krasnoi Proletarii plant. The Romi lathe is slightly lighter than the Russian, with 4-5 hp, but possesses certain features that the Russian lathe does not have.

The Romi lathe is being offered in West Germany—at prices lower than German builders.

When Romi has completed its plant expansion program the next 18 months, it will have capacity to make 5000 MIM lathes a year. Production time is expected to be cut to 100 manhours per lathe, an achievement made possible by mass-production, conveyorized techniques.

Romi's policy is to put machines through its shop in large lots, such as 150 to 250 at a time. Biggest batch on existing lines has been 36 machines, all of which were submachined, finish machined, subassembled, assembled, tested, painted and shipped in 19 working days.

Current capacity of the Romi plant is 3000 machines a year, consisting of a range of various-sized engine and turret lathes.

Romi states that its selling prices are 55 to 60% under the equivalent US machines. The company hopes to sell its entire output in Latin America. Romi lathes have nickel-chrome hardened and ground gears and a Romi-patented Hidro-velomatic constant speed drive giving smooth acceleration and deceleration.

Navy places orders . . .

Some people have the idea that the armed services have stopped machine tool buying altogether. Not true. The Navy in particular has been making substantial purchases and will continue to.

Training for numerical control . . .

Three sales training courses in numerical control were conducted the past few weeks by the American Machine Tool Distributors Association in cooperation with the Boeing Applied Computing Services, Wichita, Kan. Sales engineers of distributor firms belonging to the association attended the courses. The first was held August 3-4 in Los Angeles, the second August 5-6 at San Francisco, and the third August 9-10 at Wichita. The courses were taught by Boeing personnel and were scheduled ahead of the Machine Tool Exposition so that sales engineers would be familiar with numerical control, which promises to be the dominant feature of the exposition.

Soviet tools in West Germany . . .

Soviet-built machine tools will be sold in West Germany by Gertner, Fuhrmeister & Co, Cologne, which has just been appointed exclusive sales agents by Stankoimport, Russian government trading agency. Range of machines available will include lathes, automatic screw machines, milling machines, boring machines, grinders, and gaging and sizing equipment.

Gertner, Fuhrmeister & Co already is carrying a stock of 40 to 50 Soviet machines available for immediate delivery. This alone will be a powerful sales argument, because deliveries of machines made in western Europe are long.

Prices are said to be competitive with German machines and, in some cases, lower. Servicing facilities are provided by a staff of Russian and Soviet-trained German engineers. Company claims that it gives 24-hr parts service.

Inquiries thus far for Soviet machines are from small plants attracted by prompt deliveries and by low prices.

Up until now only a small number of Soviet machines have been coming into West Germany, mostly through Austria.

A recent trade agreement between Moscow and Bonn provides for a six-months' quota of $2.5 million of Soviet machines to come into West Germany, with a like amount for the following six months.

Soviet competition is minimized by a leading West German builder who thinks that Moscow will have only limited success selling its standardized machines. Reason is that German users, even the smaller shops, prefer machines tailored to their own requirements. This German builder feels that the Russians will have greater success with their machine tools by selling them to underdeveloped countries.

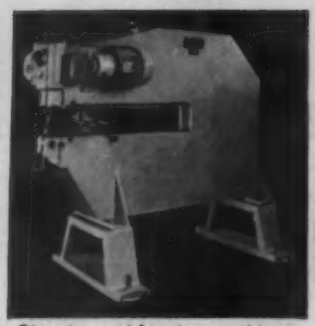
27 big presses bought . . .

Ford of England is reported to have placed an order for 27 big Danly mechanical presses. This is believed to be the largest order coming directly out of the Olympia Show in London.

The presses will be built by Harland & Wolff Ltd in Scotland, Danly licensee. Order is said to be around $4 million.

B.F.

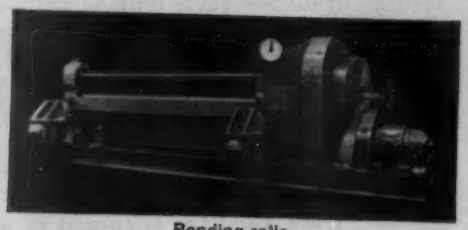
Combination shear, punch and coper



Shearing and forming machines

Arc welders

Roll forming machines



Bending rolls

Hack saws

Power squaring shears

Drill presses

Straight side presses

Hoists

Press brakes

Rotary shears

Apron brakes

Bulldozers

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MATERIALS...

Metal-wear research...

Fundamental research aimed at developing a metalwear science has united ten industrial firms in an extensive program now underway at Armour Research Foundation. Unraveling the age-old enigma of metal wear would aid in selecting and developing alloys for piston rings, bearings, machine-tool ways and slides, gears, etc. Savings resulting from these developments would reach many millions of dollars annually.

Wear and friction are probably the least understood and most difficult engineering properties to evaluate. ARF's metal-wear team consists of researchers in metals, mechanics, physics, and chemistry. The program is planned for three years; will cost $300,000.

Sponsors of the research are: American Steel Foundries, Bethlehem Steel Co, Briggs and Stratton Corp, Clevite Corp, Dow Chemical Co, International Nickel Co, Socony-Mobil Oil Co, and United States Steel Co.

Universal programmer...

Originally designed for metallurgical research, a new programmer introduced by the Wheelco Instruments Div of Barber-Colman Co, Rockford, Ill, is said to be unusually flexible. Typical programs it can handle might include, for heat treatment, three time-temperature rises, and three soak periods, as well as two temperature rises, one fall, and a soak period along with all the combinations which can be achieved by using index switches, timers, and input controllers. This entire programming operation is finger-tip controlled. Additional equipment can provide either a magnetic-media input or a printed record of the program as performed.

Solid-state timer...

An electronic sequence timer having no moving parts is being shown to appliance manufacturers by P R Mallory Co, Inc. The timer is not commercially available, yet, but is intended to demonstrate control techniques which Mallory expects will be in wide use in several years.

No motors, cams, contacts, or other mechanical parts are used in this timer. It uses transistorized logic circuits similar to those in electronic computers. Installed in a conventional automatic washer, the timer is spread across the back panel for the demonstration but can be miniaturized to fit a much smaller area.

"Timer" is a misnomer. Actually, the device is a complete programmer. Timing is provided by an electronic clock which supplies a voltage pulse at time-spaced intervals to advance the cycle control to another switching module. Instantaneous programming is a fundamental characteristic of the command center. Whereas mechanical systems must, at best, speed through unneeded parts of a basic program, this system merely eliminates those parts of the program.

Competitive components...

Sylvania Electric Products offers a transformer for TV sets and computers which is 30% smaller, and lighter, than conventional designs. General Electric Co has a vacuum tube called the Compactron that puts the ability of three or four standard tubes in one glass envelope. These smaller, cost-reducing electrical devices are indicative of a growing effort to meet and beat competition from overseas.

Plastic netting...

Polyethylene can be directly extruded into net form by a process created in the laboratories of E I du Pont de Nemours. Called Vexar, the netting is produced in a single operation by special machinery developed in England. Strands can be made thicker than a pencil or as fine as coarse thread. Uses for the netting range from decorative jackets for bottles to protective sleeves for machine parts.

Beryllium-titanium alloys...

Heat-treatable to high surface hardness while retaining a soft core, a new series of heat-treatable titanium alloys is being developed by Imperial Chemical Industries, Ltd. The new additives that create these properties are beryllium and molybdenum.

Binary alloys containing 0.6 to 1.2% Be and having a hardness of 228-241 Vickers (Vhn) before heat treatment show a case hardness of about 500 Vhn after heat treatment, while the core hardness drops to less than 200. Yield strength is in the 100,000 psi range, and elongation is 5 to 11%.

Ternary and quaternary alloys containing 0.25 to 2% molybdenum and/or silicon provide even greater surface hardness and depth of penetration. In addition, these alloys hold their hardness at temperatures in the 700F range. Perhaps this new avenue into alloying titanium will provide the needed ingredient to accelerate the use of this metal in commercial products.

Stabilizing rocket — delivered by AIR EXPRESS — gets high-temperature environmental test at California laboratory

Space rocket gets a lift from Air Express

These men aren't on their way to Mars—yet. But the amazing rocket they're perfecting brings that day closer and closer. Right now, they're putting its components through their paces at the North American-Rocketdyne field site in California. The little stabilizing rockets, about to be tested here, have already flown successfully—by AIR EXPRESS . . . the world's fastest, most dependable way to ship. If speed, kid-glove handling and dependable delivery — all at low cost — are vital to your business, always call AIR EXPRESS. And make sure your products, parts and new models are FIRST TO MARKET... FIRST TO SELL.

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WHAT'S AHEAD... in Metalworking

TRENDS

Outlook bright for the machine-tool builders...

During the months ahead the metalworking industry will be spending far more for new machine tools than it has in several years. The AM/MM survey of metalworking's buying plans for the period from June 1960 through December 1961 shows that a total of $1.5 billion will be spent for new metal-cutting and metal-forming machine tools. (See p169).

Farm machinery builders will spend $21.8 million for new machine tools. Of this total, $12.2 million will go for metal-cutting machinery, $9.6 million for metal-forming machinery.

Construction, mining, and materials handling industries will be buying $37.1 million of new machine tools. Cutting machines will account for $30.2 million, forming for $6.9 million.

Metalworking machinery builders, themselves, will invest $138.7 million. Of this, $133.5 million will go for the purchase of metal-cutting machines, $5.2 million for forming equipment.

Special-industry machinery builders will account for a total of $58.8 million. $53.8 million will go for cutting machines, $5 million for forming.

General industrial equipment manufacturers plan to spend $127.5 million for new metal-cutting machinery, $7.8 million for forming equipment, for a total expenditure of $135.3 million.

Fabricated metal products producers, by far the largest industry group in this survey, are planning to spend $296 million. Metal-cutting machines will account for $212 million, forming machines for $84 million.

Office and service machine manufacturers will put $50.2 million into new cutting machines, $25.4 million into new forming machines, for a total investment of $75.6 million.

Electrical equipment manufacturers, in this 19-month period, will lay out a total of $142 million for new machine tools. $102.5 million will go for cutting machinery, $39.5 for forming machinery.

Builders of communications equipment are planning to buy $52 million worth of new cutting machinery, $9.4 million worth of new forming machinery, for a total outlay of $61.4 million.

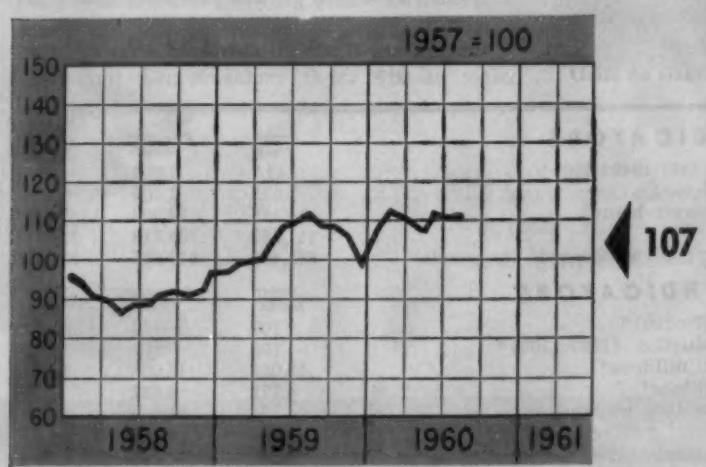
The automotive industry (motor vehicles and parts), always one of the big buyers, will purchase $131.5 million worth of metal-cutting machine tools, $33 million worth of metal-forming machines, for a total of $164.5 million.

Aircraft and aircraft parts producers, now known as the aerospace industry, plan to spend a total of $159.7 million. Of this, $147.5 million will be for cutting, $12.2 million for forming.

Manufacturers of precision mechanisms report a planned outlay of $36.2 million, $31.4 million of which will be for cutting machines, $4.8 million for forming equipment.

Shipbuilding, ordnance, and railroad equipment companies expect to buy $22.1 million worth of metal-cutting machine tools, $10.2 million worth of metal-forming machines, for a total investment of $32.3 million.

Forge shops, foundries, and miscellaneous metalworking concerns will spend a total of $145.9 million for new machine tools. Of this, $127 million will go for cutting machines and $18.9 million for forming machines.

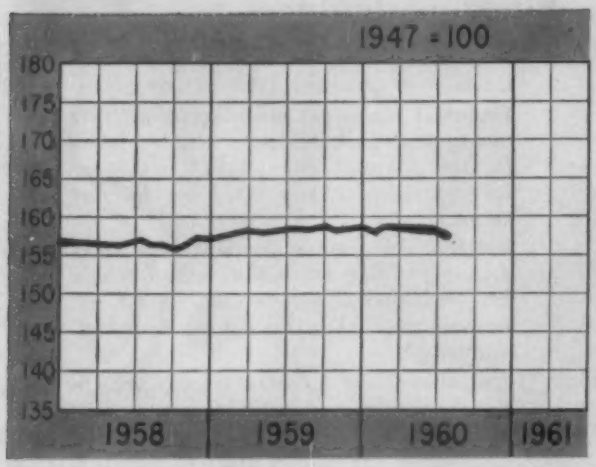


AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**107**	**107**	**108**	**107**
Machinery	105	104	104	
Electrical Machinery	115	115	110	
Autos	120	120	113	
Other Transportation	87	93	96	
Other Metalworking	111	111	112	

TRENDS WHAT'S AHEAD... in Business



158.7

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JULY Estimated	JUNE Preliminary	MAY Revised	JUNE Year Ago
Total Index	**158.7**	**159.5**	**159.6**	**159.2**
Metalworking Machinery	**192.0**	**191.2**	**185.7**	
Other Machinery exc. Electrical	**172.6**	**173.0**	**171.0**	
Electrical Machinery	**160.4**	**160.2**	**160.5**	
Fabricated Metal Products	**147.7**	**147.8**	**148.8**	

Capital spending in the '60s...

Growing capital expenditures will be a key force in our expanding economy in the decade ahead. As in the past, businessmen will be spending to enlarge and modernize plant, but they'll also be stepping up their outlays for facilities to produce new products—products that will come out of research and development in industry. As a result, spending for new plant and equipment by all business should hit $46 billion by 1965, and increase further to $56 billion by 1970 (expressed in 1960 dollars).

New products, already important in the sales picture of many firms, will grow in importance as we move into the '60s. A recent survey by McGraw-Hill showed that manufacturers now expect 12% of their 1963 sales to be in new products (products not now made). And a number of firms are spending a substantial part of their capital budgets for facilities to turn out such products.

If industry continues its heavy emphasis on R&D there is a good chance that new products will account for a third or more of manufacturing firms' sales in 1970. And this heavy schedule of new product development could mean that capital spending will surpass the $56 billion mark by 1970.

In addition, firms will continue to spend to eliminate obsolescence. Emphasis on modernization in recent years has cut into the $95 billion backlog of obsolete plant and equipment uncovered by a 1958 McGraw-Hill survey. But much inefficient plant and equipment is still in use. And firms will be replacing it to boost productivity.

As always, growing business will demand expansion of facilities in many industries. Biggest increases in capital spending are likely to come in industries where growth prospects now seem brightest. Non-ferrous metals and machinery producers are likely to spend at a fairly rapid pace, as are other metalworking industries.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	148.1	148.8	152.9
Steel ingot operation (thousands of tons)	1,535	1,500	345
Electric power output (million Kilowatt hours)	14,425	14,208	13,577
Production of automobiles	111,262	105,113	124,446
Engineering construction awards (Eng. News-Record—thousands)	365,465	519,835	331,520

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1957=100)*	109	110	110
Index of durable manufactures production (1957=100)*	106	107	110
Durable goods manufacturers' sales, millions*	15,087	15,005	15,515
Machinery manufacturers' sales, millions*	4,772	4,832	4,507
Durable goods manufacturers' new orders, millions	14,626	14,469	15,241
Machinery manufacturers' new orders, millions	4,764	4,756	4,626
New Orders for Nonelectrical Machinery (1950=100)*	177	188	175
New Contracts for Industrial Construction (1950=100)*	154	141	142

* Seasonally adjusted

A Winning Combination...

"American" HOLE WIZARD RADIAL } + { INGENIOUSLY DESIGNED FIXTURES

The time on this job was cut to the bone by the combination shown by the illustration. All boring, facing, drilling, tapping and counterboring on the entire job was done in one work setting by means of an ingenious swiveling fixture.

The essential contributor to satisfactorily performing this variety of work is unquestionably the "AMERICAN" Double Lo-Hung Spindle Drive. This is an exclusive "AMERICAN" Hole Wizard feature. It divides the speed range into two separate ranges; the high speeds through a comparatively small gear to minimize gear velocities; the low speeds through a large diameter, wide faced gear to reduce gear tooth pressures to insure minimized wear under severe service.

To further reduce wear and to insure maintenance of original accuracy the spindle and sleeve are made of nitralloy steel nitrided for extreme surface hardness and are mounted on large precision Timken Bearings with convenient outside adjustment which guarantees maximum life, dependable operation and unequalled spindle stability for the life of the machine.

These exclusive "American" features permit your putting your radial drills to work at a profit

There are other advantages too — write for bulletin No. 328.

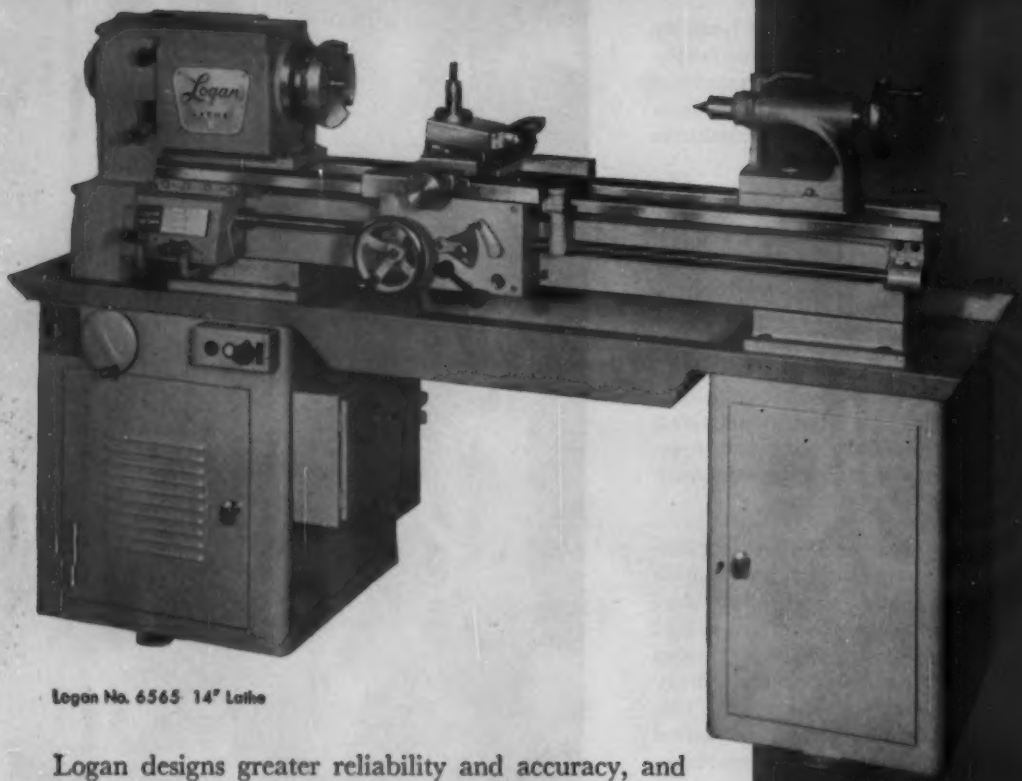
THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

CIRCLE 839 READER SERVICE CARD

its specifications add up to high production capacity

Logan 14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-quality features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
- A variable-speed drive lets you change speed while work is turning—without shifting belts
- A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.

There are many more reasons why this and other Logan Lathes have a greater capacity. The specifications tell the story. Write for literature and complete information.

- Spindle speeds to 2000 rpm.
- 1½" Levermatic collet chuck capacity
- 14⅛" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

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American Machinist | Metalworking Manufacturing ESTABLISHED 1877

Such as You Have Never Seen

You are about to see an exposition such as you have never seen before.

Quite a statement, to be sure, but fully justified by the facts. For the Machine Tool Exposition at the Chicago International Amphitheatre from September 6 to 16 will be such an exposition.

Good and rewarding machine tool shows have been held in the past. Our own shows in 1947 and 1955, as well as the European shows every two years, are prime examples. The British International Show at Olympia is another example.

But the upcoming Machine Tool Exposition in Chicago will truly be different from all others. The difference is not because of size or high-powered publicity.

All of the manufacturing eyes . . .

in the metalworking industry will be on the International Amphitheatre because the machines displayed there will represent a major technological break-through. And it just so happens that this break-through happily coincides with the five-year cycle of expositions of the National Machine Tool Builders' Association.

You have heard and read much about numerical control. But it has come to you piecemeal as one individual development after another reached the practical stage of marketability. Up to now many of the developments have been in the hush-hush stage as individual machine tool builders rushed to completion their own designs and adaptations.

At Chicago next month, for the first time anywhere, you will see in the International Amphitheatre the full results of numerical control applied to machine tools. Our own latest count turns up the startling fact that at least 69 numerically controlled machine tools will be in operation. These machines are listed on page 191 of this issue. Many of them are described elsewhere in this issue.

You can add to that number about a dozen more numerical control exhibits at the Production Engineering Show which will be held at Chicago's Navy Pier concurrently with the Machine Tool Exposition.

While numerical control . . .

will constitute the major technological break-through at Chicago, other notable new developments will be shown not only at the Amphitheatre and Navy Pier, but also at the Coliseum Show. To name several of them: compact machines designed to give the most for your money; extension of the art of tracer control; machines performing operations in sequence, with automatic loading and unloading; inclusion of automatic assembly as part of the processing sequence; automatic checking and gaging at successive stations; further spectacular gains in a machine's ability to produce work fast and machining to millionths of an inch.

A spot check . . .

of many large machine tool users reveals their awareness of the overwhelming significance of the Machine Tool Exposition. These users expect to send all their key manufacturing men to Chicago next month. They realize that they cannot afford not to send them.

The machines to be on display at Chicago represent the only practical means of achieving the cost reductions that must be made for survival and growth in both domestic and foreign markets in the years immediately ahead. That is why it is so imperative that as many of these machines as possible should be put to work in users' plants just as soon as possible.

Burnham Finney EDITOR

Space-Age metals and other refractory materials can now be micromachined without altering physical properties

... with the new HAMILTON ZEISS ELECTRON BEAM CUTTING MACHINE

PRECISION-MACHINES INTRICATE PATTERNS AS SMALL AS 0.0005 INCH WIDE

Holes, slots and the most intricate patterns can now be micromachined in such refractory materials as tungsten, tantalum, carbides and quartz. The material is "cut" by a high intensity electron beam which literally vaporizes the material with local temperatures as high as 11,000°F. The cutting beam is applied in pulses only millionths of a second long, confining the high temperature to the immediate area being "cut." Areas only thousandths of an inch away are so cool that physical properties are unchanged.

PRODUCTION-PROVED BY INDUSTRY'S LEADERS

More than a dozen companies and government agencies leading in space-age technologies are currently using these revolutionary welding and cutting machines. Typical uses include welding of microminiature electronic modules, nuclear fuel elements, and cutting of injection nozzles, filters, jewel bearings and synthetic fiber spinnerettes. The Hamilton-Zeiss machine has also been singled out by the Wright Air Development Division of the ARDC for development and evaluation of tungsten and molybdenum welding techniques.

WRITE TODAY, outlining your requirements, for specific details on how electron beam processing can help solve your unusual production problems.

HAMILTON ELECTRONA INCORPORATED

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Want to know how well a machine can do a given job? Why not . . .

ASK THE MACHINE!

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Here is a quick method, simple enough to be used by an inspector, of finding out if a machine will produce a new job within tolerance

For some reason, no two people seem to have the same idea of what a machine can do in the way of producing a particular part within tolerance. The man who sells the machine has one story. The production planner has his own views of what it can do. And the machinist who uses it has still another opinion—especially if he has tried to produce a too-tight tolerance with the machine.

It is a fact that the one really accurate source of information on what a machine can do, the machine itself, is often ignored in favor of personal bias and guesswork. Why not "ask the machine," as quality control engineers do?

Basic definitions

This involves determining the machine's accuracy, precision, and reliability in performing any given task. But because these three terms are all too frequently misinterpreted, let us here define them:

- **Accuracy** refers to the calibration of a device, tool, gage, or leadscrew to a known standard.
- **Precision** is the ability of a gage, measuring device, instrument, or machine tool to get the same result each time.
- **Reliability** is the ability of a device to perform a given task under specific conditions over a period of time. Stated in another way, reliability is defect-free operation, usually specified in terms of time or number of operations performed.

Paradoxically, a machine tool by these definitions can at one and the same time maintain precision but fail to maintain accuracy by a wide margin. In other words, it can consistently turn out parts that are almost exact duplicates, but those parts can deviate widely from known standards.

On the other hand, a machine can be accurate—producing parts of the correct size *on the average*—but at the same time lack precision. Then, some parts are too large and some are too small. This is somewhat like the man with his head in an oven and his feet in a bucket of ice. Asked "How do you feel?" he answered, "On the average I feel fine."

In these days of ever-tightening blueprint tolerances, it is vital to know the capability of a machine. We at GE have certainly found this so in the manufacture of aircraft gas turbine engines. Here are three examples of how careful attention to machine capability has overcome production problems:

Case histories

Case 1: Checking a rotary table with precision indexing at the manufacturer's plant. Here, because we were unfamiliar with the manufacturer's measuring equipment, we decided to use our own equipment to check the performance of this machine. As this was a rotary table, we used an optical polygon and an autocollimator to give us good *measurement* accuracy and precision. The table was of the change-gear type, provided with a set of gears to accomplish the multiplicity of indexings that we needed.

Our inspection and elementary statistical analysis revealed that three of the gears were unsuitable for our needs. Based on these results, the manufacturer of the table made new gears, using a more precise manufacturing technique to achieve the required accuracy.

Case 2: Getting a card-controlled automatic drill to index to an accuracy of ± 15 seconds of arc. In checking indexing with optical tooling, and by simple statistical analysis, it was found that basic positioning accuracy and positioning precision were within the required limits. However, some "odd ball" readings were obtained—classified as "out of control" points not within the limits of chance.

The cause of these readings was a new control with relatively poor component reliability. Then, at considerable effort, the manufacturer found a new control stable enough to solve this problem.

Case 3: Getting a card-controlled boring mill to table index within

Rotary table test using a 15-sided polygon

I 1st Set-Up					II 2nd Set-Up Reset Polygon 12°				
Indicated Table Position	Collimator Readings in Seconds of Arc	Repeat Reading	Avg.	Moving Range	Indicated Table Position	Collimator Readings in Seconds of Arc	Repeat Reading	Avg.	Moving Range
0	0	0	0		12	0	0	0	
24	+0.5	+0.7	+0.60	0.60	36	-2.3	-1.4	-1.85	1.85
48	+1.5	+0.7	+1.10	0.50	60	-1.5	-1.0	-1.25	0.40
72	+2.0	+0.6	+1.30	0.20	84	+1.4	+0.4	+0.90	2.15
96	+2.6	+1.6	+2.10	0.80	108	+1.0	+2.0	+1.50	2.40
120	+2.6	+2.6	+2.60	0.50	132	+2.4	+2.0	+2.20	0.70
144	+3.8	+5.4	+4.60	2.00	156	+2.6	+2.0	+2.30	0.10
168	+3.2	+3.0	+3.10	1.50	180	+1.8	+2.0	+1.90	0.40
192	+1.0	+1.2	+1.10	2.00	204	+1.5	0	+0.75	1.15
216	-1.6	-2.0	-1.8	2.90	228	-2.5	-2.0	-2.25	3.00
240	-1.8	-0.8	-1.30	0.50	252	-4.0	-2.8	-3.40	1.15
264	-2.1	-2.7	-2.40	1.10	276	-4.1	-3.7	-3.90	0.50
288	-3.9	-2.9	-3.40	1.00	300	-4.7	-4.7	-4.70	0.80
312	+0.9	+1.5	-1.20	2.20	324	-4.5	-3.7	-4.10	0.60
336	+0.2	-1.0	-0.40	0.80	348	-4.1	-2.9	-3.50	0.60
0	-0.2	-0.5	-0.35	.05	12	-1.0	-0.4	-0.70	2.80
			+5.65	16.65				Total	18.60
				18.60					
			Total	35.25					

$$\bar{\bar{X}} = \frac{+5.65}{15} = 0.38 \text{ seconds} \qquad \bar{\bar{R}} = \frac{35.25}{30} = 1.18 \text{ seconds}$$

± 15 seconds of arc. It was intended that the control be set at zero with the table located in any circumferential position—thus making coincidence of the part to an index line unnecessary.

Our inspection data showed that the machine was capable of meeting the specification requirement of a total indexing spread of 30 seconds. But the accuracy of indexing varied from ± 0, – 30 to ± 15 seconds, depending upon the circumferential position. For the required accuracy, it would not be possible to set zero with the table located at any circumferential position.

A partial solution: find the midpoint of the total runout of the table's ring gear (the source of the inaccuracy). Further study indicated this midpoint could be set to the index line within ± 5° without significant effect on the final indexing results. Thus, by learning the machine's detailed characteristics, we were able to use it successfully.

Checking procedure

A simplified form for analyzing machine capability has been developed and is used on manufacturing and inspection tables for initial acceptance and for cyclic inspection. This form will be described later, but first let us look at our method of checking for precision or capability of a machine in instances where the operator can control accuracy by machine setting.

Getting on the right track

When, for example, a leadscrew controls machine accuracy, *precision* (ability to get the same result each time) is the measure of a machine's capability. For instance, planners in stable industries (those whose operations vary little from year to year) are able from experience to select the proper workhorse machines for making tight-tolerance jobs.

This knowledge, gained from long production experience, serves as long as production continues on the same kinds of parts, materials, machines, cutting tools, techniques and the like. But when new alloys or materials, requiring new and different machining techniques and tools, are involved, this prior experience usually cannot serve as a guidepost. For this reason, some method must be found to obtain information on the precision or capability of a machine—other than scrap-barrel experience.

It is seldom possible to predict the ability of a machine to produce parts to specification when the alloy has never before been machined. But once a process is established and production starts, machine capability *can* be measured. Thus it is possible to get onto the right machining track before large amounts of scrap are created, and often before the basic development is completed.

The faster way

Even working with established manufacturing techniques and materials, it is easier to determine machine capability by mathematical determination than it is from the accumulated experience of even the most experienced planners — and it doesn't take nearly as long.

The technique of checking machine capability is not difficult. Basically, it consists of spotchecking the dimensions of parts as they go

through their normal machining sequence. Let us suppose 20 machining operations are required to produce a part — then the dimensions of every part are checked and recorded at each of the 20 stations *in sequence.*

It is important that such measurements be taken in correct time-order (sequence) of production, so that basic machine capability can be separated from drift and other operational causes of variation that are controllable. If time-order is not followed, estimates of machine capability tend to be too high.

Then the average difference between consecutive dimensions is determined. In quality control this is known as a "range" of two. That is, the difference between the reading on Part 1 and Part 2 is recorded as one range. The same difference is then recorded for each consecutive pair of parts.

The average of these ranges is the basis for estimating a machine's ability to produce parts to the same dimension under operating conditions existing at the time of recording. This estimate is taken over the shortest practical period — the time required to produce two parts. For this reason, such factors as drift and lack of controls need not be taken into account in estimating machine capability.

The element of chance

It is necessary to look at the individual ranges, however, to see if one or two are somewhat larger than others because of chance. This is done by multiplying the average range ($\overline{R}$) by a constant. The result is an "upper control limit" for range — a value seldom realized by normal process variation. Such values do not represent the machine's inherent capability and should be discarded in making the estimate. Incidentally, however, although these out-of-control range values are not useful in estimating machine capability, they can provide much useful production information if their causes are investigated.

After these unusual, out-of-control ranges are discarded, the values of $\overline{R}$ are recalculated. The new $\overline{R}$ value is then multiplied by a suitable constant to determine machine capability.

At this point, it must be recognized that the more data obtained the better the estimate of machine capability. The amount of data also influences to some extent the size of the multiplier used in estimating capability from the average range ($\overline{R}$). Table I lists the constants needed to estimate the capability (precision of the process) and the limits of uncertainty of this estimate.

This table takes into account the effect of the amount of data by providing constants dependent on the number of ranges of two used to calculate $\overline{R}$.

For example, if 20 ranges of two (40 parts) are used in calculating an $\overline{R}$ of 0.003 in., a machine's capability and uncertainty are calculated as follows:

In column (a) of the table is a line showing the figure 20 (number of ranges of two in the average range $\overline{R}$). In this same line in the next column (b) we read 5.25 (multiplier for process capability estimate 6σ). Multiply $0.003 \times 5.25 = 0.01575$. The estimated machine capability in this example is thus 0.01575 in.

To calculate the limits of uncertainty of this estimate, we use the constants of the next two columns (c and d) the same way:

Low limit $= 0.01575 \times 0.7544 =$ 0.01188 in.

High Limit $= 0.01575 \times 1.48 =$ 0.02331 in.

In other words, this data estimates the capability of this hypothetical machine as about 0.016 in. — meaning that it could meet a tolerance limit of ± 0.008. But while this is the most likely value, it may not be exactly correct. Furthermore, the limits of uncertainty of this estimate are such that we predict a 95% chance of the true value lying between 0.0119 and 0.0233 in.

Capability and accuracy

This estimate of capability has no relation to accuracy, which it must be assumed is controlled either by the operator or machine setup. The machine capability estimate really represents the piece-to-piece variation that the operator was unable to control on the trial run. Abnormal operator performance is usually detected as out-of-control points.

The technique we have developed at GE can also compare the capability or precision of a machine under differing operating techniques, as for example when new alloys or machining methods are being considered.

Other applications

Other uses for the technique: (1) to compare several machines doing the same job, to determine if any of them need repair, (2) to select the best of several machines

TABLE 1—Constants required to estimate process capability (or predict high and low limits)

Number of Ranges of Two in the Average Range ($\overline{R}$)	Multiplier for Machine Capability (6σ)*	Multiplier for Uncertainty of Capability Estimate	
		Low Limit**	High Limit**
(a)	(b)	(c)	(d)
4	4.98	0.5900	3.06
5	5.04	0.6150	2.60
6	5.09	0.6348	2.32
7	5.12	0.6512	2.13
8	5.14	0.6638	2.02
9	5.16	0.6766	1.91
10	5.17	0.6878	1.83
12	5.19	0.7064	1.71
14	5.21	0.7212	1.63
16	5.22	0.7342	1.57
18	5.24	0.7448	1.52
20	5.25	0.7544	1.48
25	5.26	0.7748	1.42
30	5.28	0.7892	1.37
35	5.29	0.8014	1.33
40	5.30	0.8116	1.31
50	5.31	0.8276	1.26
—	5.32	1.000	1.00

*In normal quality control terms this calculates the total spread which includes 99.73% (6 sigma) of the dimensions we would expect from this machine.

**These two limits include 95% of the expected values. Multiply the calculated capability by these constants to calculate the uncertainty limits.

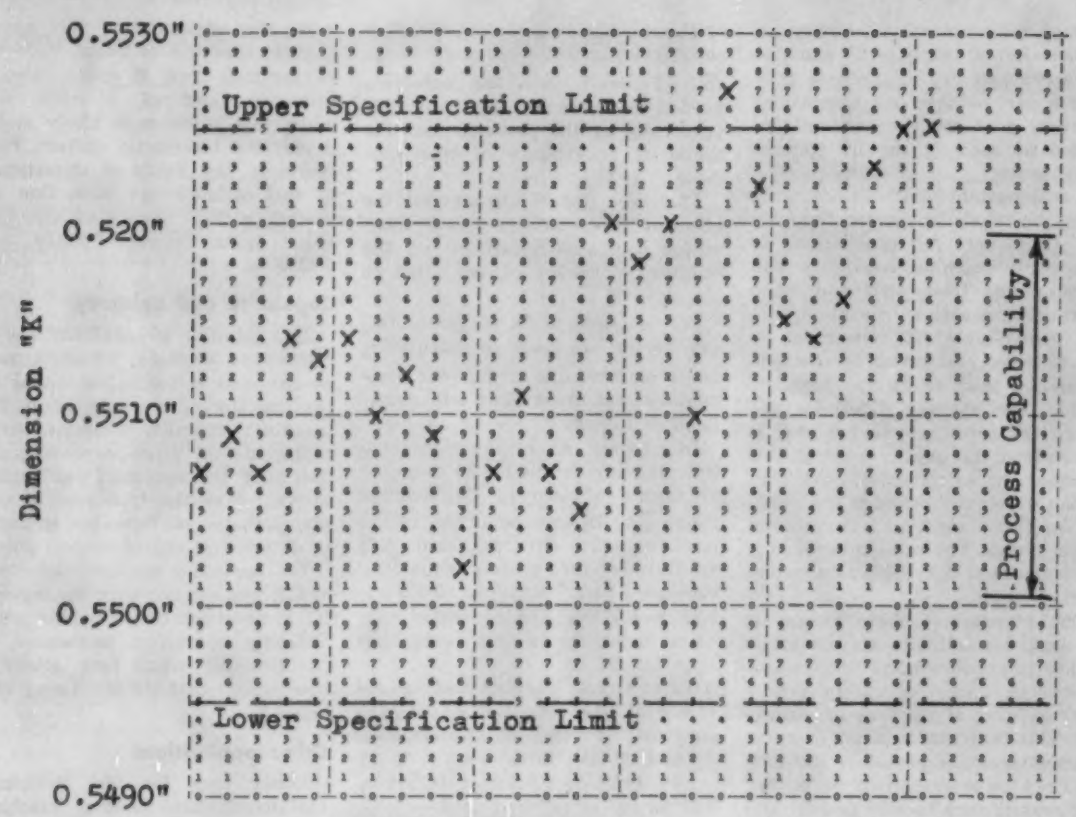


Fig. 1–Measurements of parts are made in the "time order of production." Readings are taken on consecutive parts and the difference in a pair is termed the "range of two." Charted results show that the machine lacks aim

Readings	Range
1-2	0.0002
2-3	0.0002
3-4	0.0007
4-5	0.0001
5-6	0.0001
6-7	0.0004
7-8	0.0002
8-9	0.0003
9-10	0.0007
10-11	0.0005
11-12	0.0004
12-13	0.0004
13-14	0.0002
14-15	0.0015
15-16	0.0002
16-17	0.0002
17-18	0.0010
18-19	0.0017
19-20	0.0005
20-21	0.0007
21-22	0.0001
22-23	0.0002
23-24	0.0007
24-25	0.0002
25-26	0.0000
Sum	0.0114

for difficult jobs, (3) to compare operator performance and (4) to compare different techniques.

Estimating for a new alloy

Our job was to grind the complex contour of a turbine-blade dovetail on a double-wheel contour grinder. The grinder had a cam-controlled diamond dresser that automatically produced the desired contour on one of the grinding wheels. This wheel then ground a crush roll to the mating contour. By crushing the two wheels against this roll, identical mirror image contours for a symmetrical dovetail were generated on each wheel. The part was then ground on both sides in one operation.

Theoretically, we should have gotten the same (mirror image) contour on each side. However, in initial production, the part (which had 12 inspection dimensions) did not meet specifications in all cases. It was unusual to find a single part without at least one dimension out of blueprint. In fact, this is usual with a part involving 12 dimensions.

For instance, if each dimension has a 10% chance of being out of print — with 12 dimensions the part has a 120% chance of having a dimension out of print. This situation was discovered when we evaluated the suitability of the machine for this production job.

We ran a capability study on 26 consecutive parts. Unusually large drifts occurred in some dimensions on certain parts. On other dimensions, the consistency was good. In still other cases, precision was excellent but the accuracy (average value) did not fall at the correct location in reference to the tolerance.

Furthermore, dimensions across the dovetail were operator controlled, and these were subject to his setting of the machine. Dimensions not controlled by the operator were those that did not go across the part but were measurements within one side. These dimensions were primarily controlled by grinding-wheel contour, which is affected by the accuracy and precision of the cam-controlled dresser and wheel breakdown.

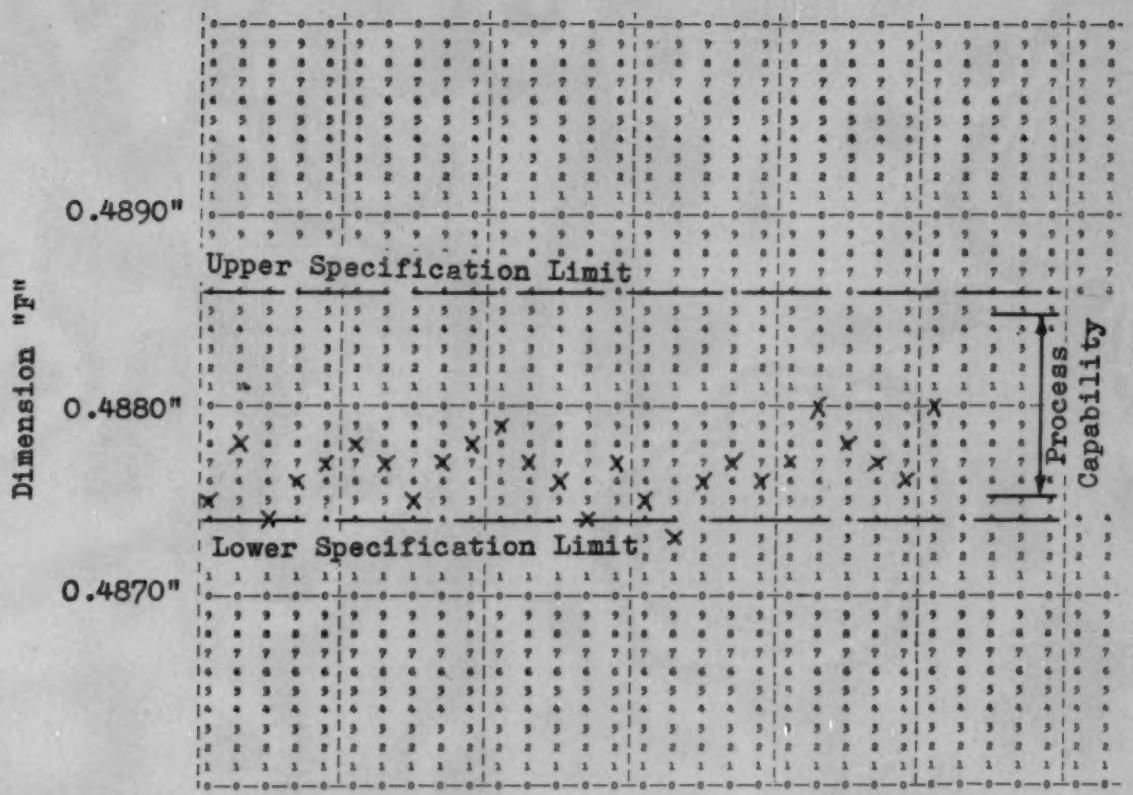


Fig. 2—No apparent drift is taking place for another dimension of the part

The initial study, using the average-range method, told us that the machine was capable of consistently producing parts with each of the 12 dimensions to specifications. Our failure to meet specifications arose from inability to set up, adjust and run the machine properly. Fortunately, the initial data also provided guidance on how to correct this situation.

Initial data

Here is the kind of data we obtained:

- On some dimensions, precision was adequate, but accuracy was a little off target. This gave us a low probability, but always a chance, of producing some defects.
- In some cases, it was necessary to modify the cam-controlled dresser to adjust the accuracy of the grinding-wheel contour.
- In one instance, knowing the geometry of the part and machine, we saw that two of the machine's shafts were obviously not parallel, causing lack of accuracy in producing the part.
- Inconsistent results (traceable to the operator) indicated that we should provide him with feedback information (control charts) from the measured dimensions of the part. After that, he was able to achieve accurate control.

Some of our plots will indicate our methods and their results. Fig. 1 plots the *K* dimension of 26 consecutively produced parts in the order of their production. The sum of the ranges of these values is 0.0114 in. and the average range is $\overline{R} = \frac{0.0114}{25} = 0.000456$. To obtain the upper control limit for range of two we multiply $\overline{R}$ by 3.267.

This constant (3.267) is taken from standard statistical control chart tables. This, when multiplied by the average range ($\overline{R}$) of two, will calculate the upper control limit for the individual ranges of two.

Then the upper control limit is:

$UCL_R = 3.267 \times 0.000456 = 0.00149$ in.

Hence the 0.0015 in. and the 0.0017 in. values for range are "out of control" and not representative of good process operation. Taking these two values out, the new sum is 0.0114 – 0.0032 = 0.0082. The new $\overline{R} = \frac{0.0082}{23} = 0.000357$ in. From Table I, the multiplier to obtain machine capability is 5.26 (read at 25 as the nearest to 23 $\overline{R}$'s). Then $5.26 \times 0.000357 = 0.00188$ in.

This is our best estimate of the machine capability and we can calculate using the constants in Table I (columns c & d) the uncertainty of this estimate:

Low limit = 0.00188 × 0.7748 = 0.00145 in.

High limit = 0.00188 × 1.42 = 0.00267 in.

For dimension *K* we were allowed a tolerance spread of 0.0030 in. (limits = 0.5525"/0.5495"). One part of the 26 was out of print with two right on the border line. (See Fig. 1). However, capability of the machine was such that with proper operation it should be able to hold all of the parts within a spread of 0.00188 in.

Fig. 1 shows that parts 1 through 14 were made at an average value

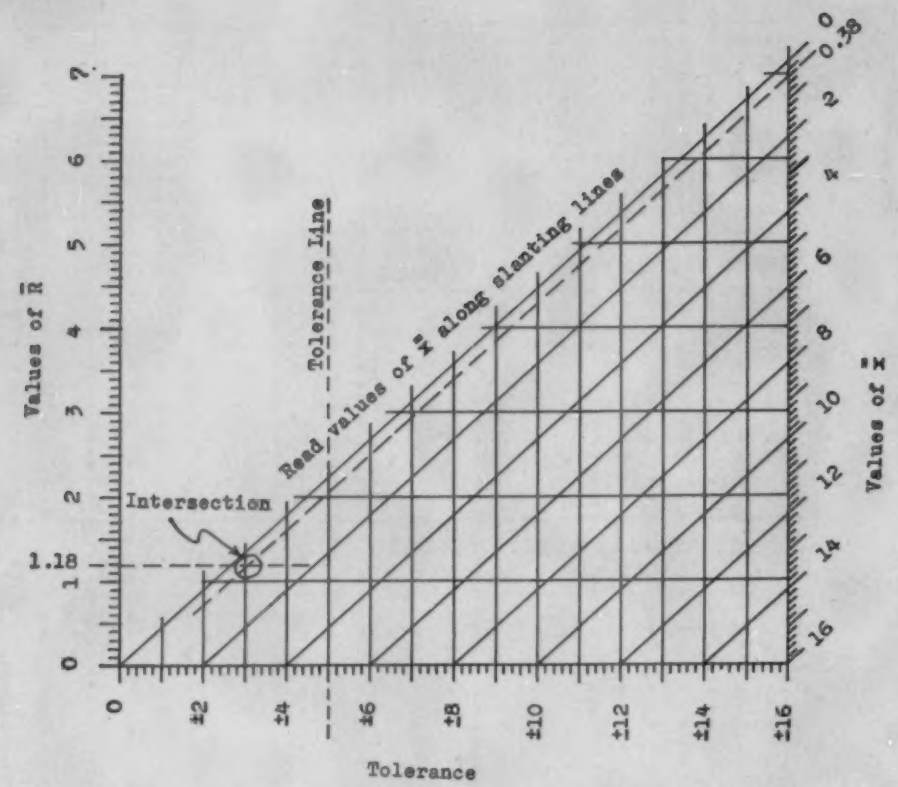


Fig. 3—By means of this graph, you can ascertain whether a machine or rotary table will function within tolerance. This graph adds the average range $\bar{R}$ to the error estimate X, and the intersection of the dash lines shows whether the machine or device will work within tolerance (at left of tolerance line)

below the specification mean (0.5510), while parts 15 through 26 averaged well above the specification mean. These two periods represent two different settings or "aim" of the machine and show that it is lack of proper aim that accounts for defects.

Dimension *F* on the same part shows a slightly different situation. Fig. 2 shows that all values are in the lower half of the specification spread, and that there is no apparent drift. No values for range are beyond the control limits, and a process capability spread of 0.00099 in. is attained. The machine tells us that with adjustment for "aim" it will meet the specification.

For dimensions *F* and *K* we were able to adjust and control the process to meet specifications consistently. We also achieved a low probability of a part not meeting requirements. In fact, not more than 5 to 10% of the parts had any of the 12 dimensions out of print, and the deviations were so small that essentially all of the parts were acceptable.

From our experience with capability studies, it can be said that the machine making the parts will produce parts to blueprint requirements in more than half the cases. If a job must be attempted on a machine lacking in capability, we are faced with these alternatives: (1) modify the process, (2) obtain a new or different machine, or (3) accept a high reject rate as a cost of doing business.

The decision is an economic one, but it should be made from good estimates of the cost of each alternative. It is practical to use the machine capability estimate to predict the number of unusable parts. Thus, the cost of rejects, as an expense of doing business, can be determined.

Controlling the machine

Economical production of close-tolerance parts involves more than determining machine capability and matching it to tolerance requirements. Sufficient control over the machine must also be established in order to achieve inherent precision. To do this, we must feed back size information to the operator or machine control, so that the machine can be kept on target by proper adjustments.

Control charts are an excellent means of keeping a manually controlled or adjusted machine on target.

The proper use of these control charts will not only help control machine operation but will also provide a means of constantly monitoring machine capability—so that machine troubles can be detected, sometimes before any rejects are made.

We have just discussed the measurement of machine capability (precision) without measuring accuracy. For such equipment check outs as those of the rotary tables (Cases 1, 2 & 3), it is especially necessary to measure both precision and accuracy. And because machine performance in these instances is a combination of these two characteristics, it is desirable to combine the evaluation. In so doing, we take advantage of the fact that exception-

ally good precision allows or corrects for poor accuracy and vice versa.

To simplify the evaluation of rotary tables (the same concept would apply to other equipment) we have developed a recording form and a graphical evaluation form which greatly simplifies this procedure.

Evaluation with a polygon

Example: In this instance we used a 15-sided optical polygon, with faces 24° apart, as a basic standard. With the polygon properly mounted on the table, we zeroed the autocollimator on the 0° face of the polygon. The table was then rotated 24°, with its own control and rotating mechanism. We then read the autocollimator. If the table actually moved 24°, the autocollimator would read a zero error. If it moved 23° 59' 58" we would read and record a 2-second error.

Two readings were taken on each position. These readings are recorded on Form 1 in the columns marked "Collimator reading" and "Repeat reading" for the corresponding degree position on the polygon.

The average of the two readings for each position is recorded in the average column. When the original and repeat readings were completed on the initial (0°) set up we rotated the table 12° and reset the polygon to 0°. A second set of readings was taken at this position and recorded on the right side of the form. This was done to provide data on additional points so as to give a better estimate of the precision of the table.

After the averages were obtained for all positions, the ranges (difference) between the averages obtained for consecutive positions were determined and recorded in the columns marked "range." We then added all of the ranges and averaged them. In the illustration this calculates to be 1.18 ($\overline{R}$). The averages obtained for the first polygon position only were added and a grand average calculated. This value is + 0.38" (X). We used only one polygon position, because the 12° polygon reset was made with the table, not with a precision standard such as a sine bar.

We now have an $\overline{R}$ which estimates the table precision and an X which estimates the accuracy. (In this particular use of the method, the $\overline{R}$ includes some accuracy variation and the X is primarily an estimate of the average accuracy bias, but since it is the combination that is desired anyway, the end results are a measure of this combination.)

To evaluate these in combination, the special graph (nomograph) in Fig. 3 is used. This graph converts the $\overline{R}$ to an estimate of precision and adds it to the error estimate. This combination is compared with the allowable tolerance. Using the graph in Fig. 3, this is accomplished by drawing a horizontal line through the calculated value of $\overline{R}$ on the left-hand vertical scale marked "values of $\overline{R}$." We next draw a diagonal (parallel to the diagonal lines on the graph) line through the X value on the right-hand vertical scale marked "values of X."

If the intersection of these two lines occurs to the left of a vertical line through the ± tolerance value (as in this illustration) on the "tolerance" scale, the machine meets the tolerance and is acceptable. If the intersection occurs to the right of this tolerance line, it does not meet the specification and is unacceptable.

This provides us with a calculation and evaluation method that is simple enough to be used by inspectors.

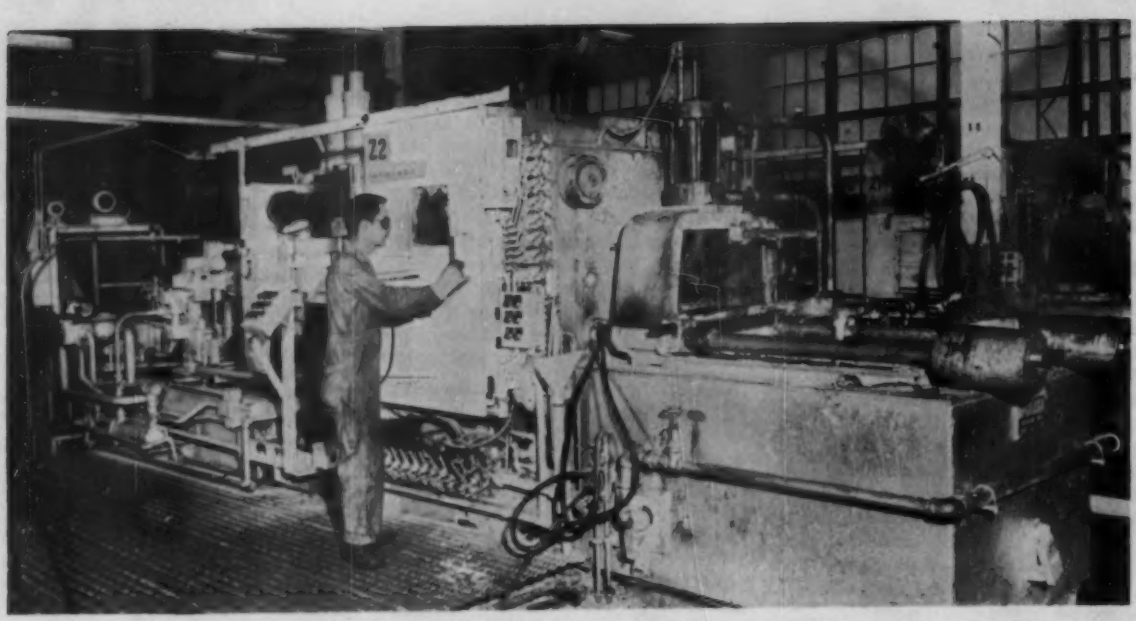
Not only is this method of evaluating the capability of a machine simple enough to be used by inspectors, it provides a factual, realistic and practical means of "putting a number" on the ability to do a job.

If horses could talk, bettors would certainly prefer to ask them whether or not they could win a race, rather than rely on human guesswork. The parallel is obvious—the best way to find out what a machine can do is to ask the machine.

Half 'n' half body drop joins Falcon subassemblies

The unit-body approach to compact-car assembly is making changes in factory routine, as well as internal construction of the cars, themselves. At Ford's Lorain, Ohio, plant, for example, the most obvious change in standard practice is assembly of the front axles, wheels, and suspensions into the welded body before it joins the engine, transmission, and rear end on a conveyor (see photo).

Instead of bolting the body to a chassis on the conveyor (because there is no chassis with the Falcon), assemblers join engine supports to body pads and connect the rear suspension to the body. Other assembly operations in the line are more or less just like they have always been; painting in booths, adding electrical equipment and trim on a body-supporting conveyor, and inspecting before the cars are driven off the end of the line.



Automatic die-casting machine heads up AC's integrated line. This 40-ton Cast Master was originally a manual machine—was converted by means of a double pump and other hydraulic components to completely automatic operation

Integrated line uncorks die-casting

Fully integrated production line for making large ornamental automotive die castings simplifies scheduling, conserves valuable space, speeds processing, and makes better use of manpower. Here is how AC Spark Plug modernized production facilities all the way from die-casting machines to packing and shipping finished parts

By Amos Childers
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Integration of a line forces the immediate solution of any problem which might affect production flow.

A flat statement? Yes, but one that has been proved time and again at AC Spark Plug, where 13 conveyors, traveling 4785 feet in all, are so laid out that molten zinc feeds in at one end of the line, and instrument panels are loaded into a highway trailer at the other.

This fully integrated line came about because of the difficulty of handling bigger and bigger die castings for late-model cars. Instrument panels for the 1960 Pontiac, for example, run about 8½ pounds each, and four different types are made in quantities of around 2500 a day at the Flint plant. In all, the plant produces something like 40,000 ornamental instrument panel castings a day to meet the needs of Pontiac, Cadillac, Oldsmobile, Buick and Chevrolet.

The Division remelts about 18,000 pounds of reclaimed zinc each day to meet this volume. And it processes such die cast parts as gages, in addition to instrument panels, for GM cars and trucks.

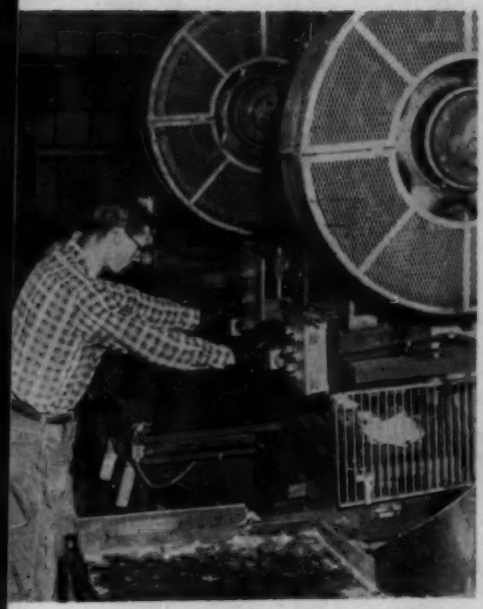
With volume pegged at such high levels, and with such variety of end products, production must be coordinated to the nth degree. That is why for the 1960 model parts run, AC decided to integrate the Pontiac instrument line completely —after finding that partial integration results in the creation of more problems than it solves.

Such a completely integrated line eliminates need for storage containers and for storage space. Parts need not be trucked away from the die casting machine to storage and then later be trucked again to secondary operations.

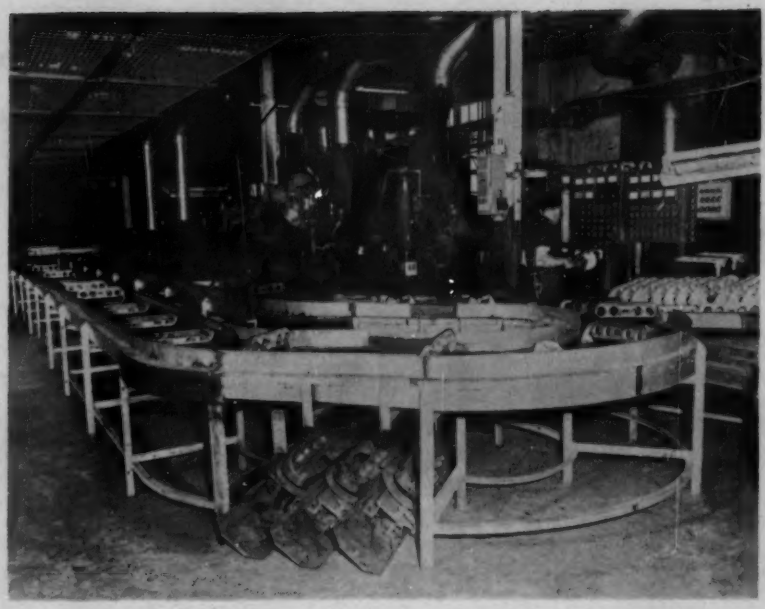
And quality control is the finest possible: Castings are processed immediately as they move along the line, receiving the inspection that comes from trimming, buffing, plating, stud-driving, and painting immediately after the casting is made.

Steady work flow

From the worker's point of view, too, integrated production is desirable, simply because it supplies him with a steady flow of quality castings. In this way, he can perform his work at a steady pace when the castings come to him and are removed on conveyors. Thus most of his energy goes into performing the operation, rather than in materials handling.



Automatic delivery of castings to Bliss trimming presses is handled by a belt conveyor under the die-casting machine



Special 12-head Acme buffing machine is completely automatic except for loading and unloading of fixtures (three spare fixtures are under the table). Oval conveyor table returns buffed castings to loading area for unloading and transfer

bottlenecks at AC Spark Plug

And finally, as stated at the beginning of this article, the integration of a line forces the immediate solution of any problem that occurs on the line and which might affect production flow. There can be no procrastination or makeshift solutions when a steady flow of parts is required to keep the line functioning smoothly.

The key to successful integration is a uniform supply of castings. Ordinarily, when the die-casting die or machine breaks down, the supply of parts is reduced or cut off entirely, with labor losses increasing every minute during downtime. An additional loss occurs if it becomes necessary to work overtime to produce castings not made during a downtime period. These overtime losses are created when facilities for buffing, plating, stud driving, painting and trucking (which were available but not used during the breakdown period) must be worked overtime to finish the casting. Storing tubs of castings is a partial solution, but this has many disadvantages.

This basic problem of uniform and continuous supply was solved at AC by installation of an overhead monorail conveyor built especially for the Pontiac castings. The conveyor runs through the trim and burr area, so that castings can be loaded onto its hangers after trimming, or can be removed for burring and finishing if for some reason the normal supply of castings from another source is reduced.

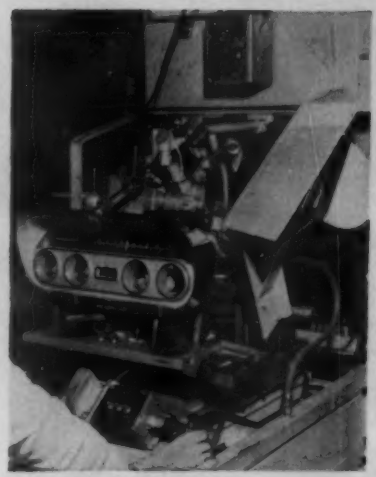
Constant castings supply

This auxiliary conveyor is always full of trimmed castings on Monday morning—so there is always an ample supply of castings for the finishing operations even if a production interruption occurs during the week. The conveyor is refilled when necessary by running the die casting and trimming facilities on the third shift or on Saturday. This single conveyor assures a uniform production of finished castings during the normal work week and it reduces to a minimum the number of people needed for overtime work to catch up.

During the week the conveyor full of castings assures people on the line that they have a full day's

Stud driving is semi-automatic with air tools that drive two at a time. Operator also loads an adjacent conveyor with instrument panels that are ready for paint and adds protective shields to those portions not to be painted

Finish painting is sprayed by hand at a water-wash installation. Before this operation, Pontiac instrument panels have been prime coated automatically with sprays actuated by limit switches as the fixtures and work move by on the same conveyor



Completed panels are given functional inspection in this setup. Panels are then sorted by types for packing in boxes prior to shipment

work ahead of them, so they produce a fair day's work. This conveyor is the most important factor in AC's integrated production line.

But conveyors are not the only improvements that expedite die-casting production. Basic problems in die casting itself have been recognized and solved. First of these is the realization that operator skill and attention to detail control quality of castings on a manually operated die cast machine.

Production of large ornamental castings of consistently high quality is difficult because of the problem of achieving uniform operating procedures.

For exampie, slight variations in cycle time upset heat balance and lower the quality of castings.

Too, manual removal of the gate from the die cast machine introduces a fatigue factor, and safety doors also require effort by the operator. At the beginning of the shift, the operator many have a tendency to operate too fast, but as the shift hours pass he becomes tired and his reaction times becomes slower.

It is also difficult for operators on different shifts to set machine controls exactly alike. All of these problems can be reduced to an absolute minimum if the die cast machine is made to operate automatically.

Convert 40-ton die caster

AC's production engineering team planned conversion of a 40-ton manual die-casting machine to completely automatic operation. This machine cycles automatically, ejecting the casting through the bed of the machine into a water-filled pit and thence onto a belt conveyor at the bottom of the pit. This conveyor discharges the casting into an elevator conveyor, which delivers it to a sheet metal tray at the trim press.

Trim dies

Trim dies in these presses are made to trim one impression only because this gives the most accurate trim, reduces burring, and improves quality. After trimming, the operator can either discharge the trimmed casting to the next operation or he can discharge it to the monorail storage conveyor. During normal operation, he discharges to the next operation.

After trimming, the castings are drilled and delivered to a tray adjacent to an automatic 12-head buffer. This machine buffs the castings and returns them to the same area where they were loaded. Buffed castings are then unloaded and placed on a plate conveyor, which moves them to the hand-buffing area, where two areas of the casting are spot buffed prior to racking for plating. Racked castings travel by monorail conveyor through a 5-stage Metalwash power washer and are then transferred to a 72-in. Hanson-Van Winkle-Munning plater.

Plated castings are unracked and placed on work station for inspection, after which they are placed on another plate conveyor and moved to the paint department, where a stud driver operator removes them, drives some of the studs, and then places them on a conveyor that carries them through the paint booths.

As castings move through this line, operators place paint shields on them and spray-paint them. Another stud driver operator removes the castings from the paint conveyor, drives the remaining studs and replaces them for delivery to an inspection station. The inspector places the work on a conveyor.

The main conveyor carries painted castings to the instrument panel assembly line, where operators remove them for assembly with component parts. The second conveyor is for storage of castings produced on the second shift. This conveyor is necessary because the assembly line only operates on the first shift and die-cast production is a two shift operation. During the first shift, the main conveyor is fed from stock coming from the paint line (as well as from the storage conveyor) to assure an even flow of finished castings to the final assembly line.

The completely assembled panel is transferred to a conveyor for delivery to final inspection. After inspection, the panels are placed in shipping cartons and the cartons are moved by conveyor to the palletizing area. When the pallet is full, it is placed on a conveyor system which automatically loads it into a highway trailer.

What Electric, Hydraulic, and Pneumatic Elements Cost

Percent of total cost in —	Electric and Electronic	Hydraulic	Pneumatic
1920	2.9%	0.9%	not available
1935	6.1	4.8	not available
1947	10.9	5.5	1.9%
1955	17.5	7.7	1.4
1960	16.8*	5.2	1.7

SOURCE: American Machinist/Metalworking Manufacturing

*On numerically controlled machines this figure is 41.8%

NOTE: Each figure represents a percentage of selling price *in that year*. Thus 16.8% of 1960 selling prices represents a higher dollar cost than 17.5% of 1955 selling prices. According to the *AM/MM* price index, prices of metalworking machinery increased 50% between 1947 and 1955, and 26% between 1955 and 1960.

Cost of automatic elements levels off

Third survey by AM/MM of the electric, hydraulic and pneumatic elements in machine tools shows that rise does not compare with previous period except in machines with numerical control

Electric and electronic components add up to 16.8% of the selling price on an average of 90 lines of new machine tools.

On an even dozen machines available with numerical control the electric and electronic costs account for 41.8% of the selling prices of the machines.

The 16.8% average represents a decline as a percentage of current selling price from the 17.5% reported in 1955, but because of increases in machine prices represents a rise of 22% in dollar figures in the five year period.

Pneumatic elements show the sharpest percentage rise in costs of control elements in new machine tools. Although the smallest of the components in terms of use (1.7% of cost), this represents an increase of more than 50%.

Hydraulic components declined both as a percentage of current selling price and as a dollar figure.

These are the broad highlights of the survey just completed of the cost of the elements that add automatic operation and control to machine tools. Similar studies were made at the time of the machine tool shows in 1947 (*AM*—Sept 11 '47, p187) and in 1955 (*AM*—Aug 29 '55, p751).

It is essential to understand what the survey does and does not show. It is not a study of the cost of these elements on machines now installed in industry. It is a study of the average cost of these elements in machines now being sold. The averages are weighted to allow for differences in price of the different machines, but they are not weighted to allow for differences in sales volume between types. Generally the sales are higher of the simpler machines with fewer such elements.

The 1960 survey is based on reports on 90 lines of machine tools. The figure for each of the 90 was selected to represent average conditions for that line. As one man put it, "average covers a mighty broad range, but figures are reasonable."

Another pointed out, "The amount of electrical and hydraulic equipment varies all over the lot between different models of the same line. Also these figures will vary from 2 to 30% depending on the end use of any particular machine." The average electrical cost for this line was reported as 9%.

Other factors that affect the totals are the amount of equipment added as tooling to the base machine. Some may be installed by the builder, some by the user, but in neither case would it be included in basic machine averages.

Electric Cost. The 1955 survey showed 17.5% of selling price being represented by electric and electronic. This would represent 13.7% of 1960 prices (using the AM/MM price index of metalworking machinery as a basis). This compares with 16.8% reported for 1960.

Total cost of one each of the 90 machines chosen as "typical" of their respective lines for the 1960 study would be nearly $2.8 million. Average machine cost was $30,875 and the median price was $19,650.

When numerical control is considered, electric and electronic costs soar. On the dozen machines reported with numerical control, the cost of adding numerical control varied from 10% to 300% of the basic price of the machine without such control.

The cost of the control system, when included, brought electric and electronic costs on these machines to an average of 41.8% of the final selling price. This, of course, does not include auxiliary equipment for computing and programming the machine.

Hydraulic cost. From 7.7% in 1955, the hydraulic costs dropped to 5.2%

in 1960. When the 1955 figure is computed as a percentage of 1960 prices it drops to 6.1%, but still exceeds the 1960 figure and indicates a 14.8% drop in dollar expenditures on the lines studied.

Much hydraulic equipment is in the form of accessories that are optional, such as chucks and tracer attachments. This was not generally included in the base machines studied.

On one turret lathe, for example, the hydraulic cost was reported at 15%. If a hydraulic chuck and bar feed is added, the hydraulic cost rises to 20%.

Pneumatic cost. From 1.4% in 1955, the cost of pneumatic equipment rose to 1.7% in 1960. If 1955 costs are computed as a percentage of 1960 prices, the figure would be 1.1%. This indicates a 54% rise in dollar volume, on the machines studied in the two surveys.

Again, as with hydraulic equipment, much of the available pneumatic equipment is in the form of optional accessories and would not be included in the base prices used in this study.

Information as to the costs of these components for average conditions in each line were supplied by the builders of the machines.

Trends by machine type

On lathes, the electrical cost (including the drive motor) on new models varies from 3.7 to 40%, with the average at just over 13%. In our 1955 survey, this range was 1.2 to 27%. However, most of the lathes show about the same electrical percentage today as they did five years ago.

The sharpest rises were in the machines of the lighter type, several having doubled the electrics in the new models. Some of the turret lathes showed sharp increases, while others were virtually unchanged.

Hydraulic equipment on lathes varied from zero to 25% this year, with the average at 6% on all lathes and 12% on those lathes that have hydraulic equipment. Almost as many lathes were reported with pneumatic elements as with hydraulic (a significant change from five years ago).

Milling machines were reported to have 5 to 35% electrical and electronic cost in 1955 and 5 to 45% today. Most of the machines, however, run from 10 to 20%. One small mill jumped from 6 to 12% in five years.

Hydraulic costs showed up on more milling machines than in 1955, and ranged from 7 to 17%, higher than on any other type of machine except one broach.

Drilling machines generally showed an electrical cost of about 10% except for those with numerical control, where it ranged up to 50%. In the few drills with hydraulic equipment, the cost ran 10%; with pneumatic equipment it ran 1%.

Grinding machines had a cost range for electrical equipment of 2 to 26.5% this year, compared with a range of 2 to 48% in 1955. Most grinders were unchanged, but a few were up and a few down.

There was a slight increase in the number of grinders with hydraulic equipment included, but the range was 2 to 20% this year, compared with 4.4 to 40% in 1955.

Pneumatic equipment was much more prevalent on grinders this time, appearing almost as often as hydraulics. Pneumatic equipment appeared on nearly half the machines, hydraulic on a little more than half. The pneumatic cost ranged from 0.5 to 10% this time. The single grinder with pneumatic equipment reported in 1955 ran 3%.

Gear-cutting equipment showed a range of 4.3 to 15%, compared with 1.5 to 31.5% in 1955. Basic equipment is generally up slightly in electrical content, but the absence of any highly automated machines reduced the top limit.

Very few gear-cutting machines have hydraulic or pneumatic equipment.

Perhaps the final word on the subject should go to the man who reports, "In general I believe it is safe to state that with the advent of numerical systems and greater functional abilities, machine tool costs have advanced some 35 to 40% where exotic controls are used. I also believe that this is worth the extra money."

Survey reveals that...

2 of every 3 metalworking plants are job shops

- Almost two of every three metalworking plants are job shops.
- Two-thirds of production workers in Metalworking are on direct labor.
- The smaller the shop, the greater the percentage of production workers on direct labor.

The source of these interesting statistics is a survey of more than 1100 metalworking plants, recently completed by AMERICAN MACHINIST/METALWORKING MANUFACTURING. With the table (right), which breaks these total figures down by plant size, you can compare your plant with others in the same employee size group.

JOB SHOP OR MASS PRODUCER?

Size of Plant by Employees	Job Shop	Mass Producer	Production Workers On Direct Labor
Over 1000	60%	40%	64%
500-999	59	41	66
100-499	61	39	72
50-99	65	35	78
1-49	71	29	83
Average, All Size Groups	65%	35%	67%

As might be expected, smaller plants (those with fewer than 100 employees) tend, more than larger ones, to be job shops rather than mass-production plants. But even in the smallest plants (those with 1-49 production workers), almost three of every ten consider themselves to be mass producers.

In the largest plants, this job-

shop-or-mass-producer percentage is even more interesting. Contrary to the popular opinion, six of every ten plants with more than 1000 employees consider themselves to be job shops. It is significant here that the job-shop percentage is roughly the same in the top three size groups presented in the table above. In other words, there are just about as many mass-production plants in the 100-to-499-employee range as in the 1000-and-over group, the survey reveals.

The table shows that the larger the plant, the smaller the percentage of production workers on direct labor. Indeed, the largest plants might well envy the smallest, where more than 8 of every 10 production workers are engaged in direct labor. As the table shows, the results of the survey do not contradict the axiom that the larger the plant, the greater the indirect support needed for front-line workers.

Complete details on the survey, including spending plans of the companies that participated, appear elsewhere in this issue of this magazine. A special 16-page report outlines machine-tool buying plans in Metalworking during the 19-month period between June 1, 1960 and December 31, 1961. This report begins on p169.

Metalworking plans for numerical control

Numerical-control systems, alone, should sell to the tune of at least $25 million in the next 18 months. This estimate is based on a sale of 1500 systems at an average cost of $15,000 per system. We believe the estimate is modest. Accompanying these control systems should be at least $60 million in machine tools.

A survey by the editors of American Machinist/Metalworking Manufacturing asked 5000 metalworking plants in 14 Standard Industrial Classification categories where they stood on the question of numerical control. To the survey, 1107 plants replied and, of this number 94 companies answered the nine questions we asked about numerical control. They were asked to answer the questions only if they had numerical control or expected to purchase a system.

Thus, 8.5% of the plants replying to the survey either had numerical-control equipment or planned to get it. Because this figure represents only about 2% of the total (5000) companies surveyed, we believe that the results are best used for approximation purposes only. However, in the land of the blind, one eye is king —and we think that much can be learned from the statistics reported.

Incidentally, in studying these results it will be extremely helpful to use the AM/MM Production Equipment Buying Study on page 169 of this issue. This study will give a broader picture of the marketing atmosphere of which numerical-control equipment will be a part.

"Do you have or plan to get numerical control equipment?"—was the first question asked. Of the 94 plants answering "yes," 41 plants now have 116 numerical-control systems in operation. In all, the 94 plants listed a total of 291 numerically controlled machine tools including, for the purpose of this study, four spot welding machines. In addition to the 116 systems presently installed, the people replying to the survey described 48 systems "on order" and "planned to purchase," within the next 18 months, another 127 systems.

Of the 291 units described, 98 units were for use in manufacturing aircraft and aircraft parts. Another 94 units were for the plants of metalworking machinery manufacturers themselves, and special-industry machinery builders described 26 more units. Thus, 218 of the 291 units, or 75% of the equipment listed, is represented by only three major industry groups.

From these figures it is obvious that the aircraft industry, which was encouraged by government effort to use numerical control for contouring, has sold itself on the benefits of this concept. Similarly, the machine-tool builders have begun to recognize that numerical control offers them a valuable production tool as well as a product. And the special-industry machinery builders — who constantly suffer from short runs, high tool costs, and spare-parts headaches — seem to have found an answer to their prayers.

It is also obvious that much still remains to be done to educate the rest of metalworking as to these benefits. And the Machine-Tool Exposition is likely to do just that.

We asked people to indicate whether their preference was for numerical positioning equipment or for contouring machine tools. As we, and most control builders, suspected, 78% of all the units listed were positioning systems. The 22% remaining as contouring systems are largely installed equipment representing the US Air Force program. Fewer than 10% of the systems described as "on order" or "planned" are for numerical contouring.

Some 39 machine-tool builders were listed by name as supplying the equipment to be controlled. As you might expect, the Burgmaster turret drill won this popularity contest with 24 mentions. However, Kearney & Trecker's Milwaukee-Matic came in a close second with 20 mentions. The first five machine-tool builders, in order of number of mentions, was: Burg, Kearney & Trecker, Giddings & Lewis, Cincinnati Milling Machine, and Pratt & Whitney.

Along with the 39 machine-tool builders, replies to the survey included 23 control builders. (In some cases, the machine-tool builders also are listed as supplying their own control systems.) In this listing, General Electric took 35% of the total number (151 units) of mentions. In order of number of mentions, the first five control builders are: General Electric, Bendix, Cincinnati Milling Machine, Warner & Swasey, and Pratt & Whitney. It is only fair to add that about one-quarter of GE's 35% was in its own plants.

We were particularly interested to learn why the survey respondents were interested in numerical-control equipment.

Here is the value they put on this concept—and frequently they checked more than one reason:

Reason	%
Reduce direct labor—	22
Minimize tooling—	12
Increase output—	11
Improve product quality—	10
Increase flexibility—	10
Reduce scrap—	9
Cut inventory—	7
Investigate use of NC—	7

It is interesting to note that reduction of direct labor is the only significant reason for purchase, even though numerical control offers many other advantages—some of which might easily provide greater savings.

Another question we asked was, "In how many years do you expect numerical-control equipment to pay for itself?" Replies ranged from one to 10 years—and three companies said 10 yrs—but three years proved most popular:

No. of years	%
1	5
2	23
3	45
5	27

The biggest surprise came when we read the replies to, "On how many shifts will this equipment normally operate?" Some 75% of the plants expect to operate their numerical-control equipment on a two-shift basis. Here's how they call it:

No. of shifts	%
1	15
2	75
3	10

Among the companies equipped with numerically controlled machine tools, who prepares the control program, tape, cards, etc? This question was asked primarily because so many newcomers to the field worry about who in their companies is qualified to do this. Apparently programming is no more of a problem than the people selling the equipment have claimed.

In 68% of the companies replying, programming is done by the Methods-Engineering Dept. Another 28% of the companies have their own Data-Processing groups. Most of the latter firms are using contouring equipment. Shop personnel, in spite of the claims that it is possible, do the programming in only 2% of the plants replying. (Most people think it impractical to use a machine operator's time for programming in the shop.) Only 2% of the companies use an outside service. One firm said this service was used only as an adjunct to its own staff—or for special problems.

"Who maintains and services your numerical-control equipment?" This was our seventh question — and one that often appears to persist in worrying potential users. It turns out that, in 55% of the companies reporting, the regular maintenance group is responsible for keeping the equipment going. And, as you will see very soon, they seem to be doing a fine job of it. Another 18% of the companies use their regular maintenance force plus specially trained personnel. Special maintenance groups and outside maintenance services, assigned exclusively to numerically controlled equipment, each, are used in 14% of the plants replying.

For most numerical control equipment, suppliers provide courses in programming and maintenance. Also, it is wise, especially at this stage in the use of the concept, for a plant to become self-reliant in these arts. The survey indicates that most companies are capable of doing their own programming and maintenance.

Downtime is always a subject for discussion wherever numerical-control builders and/or users gather. We asked, "What is the average percent of downtime for your numerical-control systems actually in production (not including initial debugging and installation time)?" And we requested that this figure broken down into causes.

Most companies among the 30 replying to this question set average downtime, for all causes, at 4 to 6%. However, 11 of the 30 companies said downtime averaged over 10%, hence the weighted average we came up with was 8.3%. These are the causes:

Cause	%
Error in programming or tape	1.6
Mechanical or electro-mechanical failure	1.6
Electrical or electronic failure	3.9
Other	1.2

This breakdown was a sharp upset to the things we have heard in numerical-control circles. Programming errors and electromechanical failures were supposedly the two major causes of downtime, with electronic failures the least cause. This survey says it isn't so. We suspect that earlier data was based on contouring systems and that the simpler programming and mechanisms in positioning systems, plus use under rougher conditions, may be shifting the blame to electronic equipment. But we only speculate.

Our last question was a simple one: "How satisfied are you with the performance of your numerical-control equipment?" Here is the most important answer of all:

Excellent—43%
Good— 47%
Fair— 7%
Poor— 3%

90% of the users are more than satisfied.

Industries covered

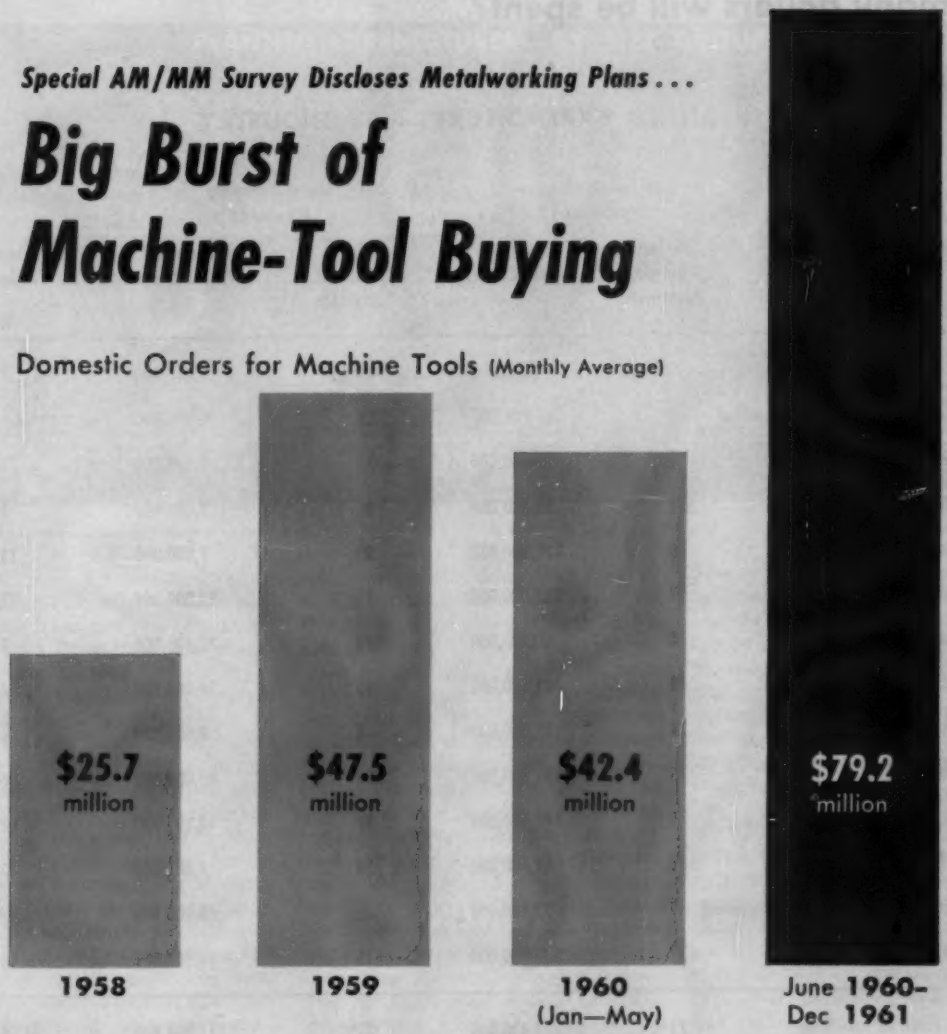
Farm Machinery
Construction, Mining Materials Handling
Metalworking Machinery
Special-Industry Machinery
General Industrial Equipment
Fabricated Metal Products
Office & Service Machines
Electrical Equipment
Communications Equipment
Motor Vehicles & Parts
Aircraft & Aircraft Parts
Precision Mechanisms
Shipbuilding, Ordnance, Railroad Equipment
Forge Shops, Foundries, Misc.

watch for the
AM/MM
CHICAGO SHOW REPORT ISSUE
September 19, 1960

Special AM/MM Survey Discloses Metalworking Plans . . .

Big Burst of Machine-Tool Buying

Domestic Orders for Machine Tools (Monthly Average)



- **Metalworking manufacturers will spend $1. 5 billion for new metal-cutting and metal-forming machines in the next year and a half.**
- **New orders will average $79.2 million a month, of which $65 million will be for cutting-type machines.**
- **Three-fifths of total dollar volume will come from plants with fewer than 500 production workers.**
- **44% of dollar buying will be for replacement and modernization, compared with 31% only five years ago.**
- **Foreign machine tools will represent less than 3% of total expenditures.**

American Machinist / Metalworking Manufacturing **Special Report No. 495 • August 22, 1960**

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How many dollars will be spent?

PLANNED EXPENDITURES — BY INDUSTRY

	Metal-Cutting Machines		Metal-Forming Machines		
	Percent Planning Purchases	Planned Expenditures	Percent Planning Purchases	Planned Expenditures	Total Planned Expenditures
Farm Machinery	50%	$ 12,200,000	45%	$ 9,600,000	$ 21,800,000
Construction, Mining, Materials Handling	68	30,200,000	25	6,900,000	37,100,000
Metalworking Machinery	84	133,500,000	10	5,200,000	138,700,000
Special-Industry Machinery	79	53,800,000	26	5,000,000	58,800,000
General Industrial Equipment	78	127,500,000	20	7,800,000	135,300,000
Fabricated Metal Products	57	212,000,000	35	84,000,000	296,000,000
Office & Service Machines	80	50,200,000	70	25,400,000	75,600,000
Electrical Equipment	78	102,500,000	55	39,500,000	142,000,000
Communications Equipment	74	52,000,000	44	9,400,000	61,400,000
Motor Vehicles & Parts	75	131,500,000	53	33,000,000	164,500,000
Aircraft & Aircraft Parts	78	147,500,000	39	12,200,000	159,700,000
Precision Mechanisms	85	31,400,000	39	4,800,000	36,200,000
Shipbuilding, Ordnance, Railroad Equipment	47	22,100,000	42	10,200,000	32,300,000
Forge Shops, Foundries, Misc.	70	127,000,000	18	18,900,000	145,900,000
Average/Total, All Industries	71%	$1,233,400,000	31%	$271,900,000	$1,505,300,000

SOURCE: American Machinist/Metalworking Manufacturing

Metalworking will spend $1.5 billion

Metalworking manufacturers have solid plans for investing during the months ahead far more money in new machine tools than they have in several years. More than $1.5 billion of orders for metal-cutting and metal-forming machine tools will be placed by the U S metalworking industry in the 19 months from June 1960 to December 1961 inclusive. The average monthly domestic orders for machine tools in this period will be almost $80 million ($79.2 million, to be exact). That is almost double the average monthly domestic bookings of $42.4 million in the first four months of this year and more than triple the monthly dollar volume during all of 1958.

To measure the total amount of machine tool buying between June 1, 1960, and December 31, 1961, orders from foreign sources must be added onto the figures already cited. This means that U S builders of metal-cutting and metal-forming machine tools should do a business considerably higher than $79.2 million a month, inasmuch as orders from abroad have been exceptionally good the past year and promise to continue that way.

This heart-warming news is the highlight of an extensive survey recently completed by the editors of AMERICAN MACHINIST/METALWORKING MANUFACTURING. More than 1100 plants reported their plans for machine tool investment in the June 1960-December 1961 period.

Monthly averages to rise

Average monthly expenditures for cutting-type machine tools by U S users will be $65 million. The comparable figure for the year 1959 is $36.8 million, and for 1958 is only $19.4 million. The equivalent month-

PLANNED EXPENDITURES — BY SIZE GROUPS

Size of Plant by Employees	Metal-Cutting Machines: Percent Planning Purchases	Metal-Cutting Machines: Planned Expenditures	Metal-Forming Machines: Percent Planning Purchases	Metal-Forming Machines: Planned Expenditures	Total Planned Expenditures	Percent of All Metalworking Expenditures
Over 1000	95%	$ 355,000,000	57%	$ 64,000,000	$ 419,000,000	29%
500-999	87	142,300,000	46	28,000,000	170,300,000	10
100-499	79	320,000,000	34	64,900,000	384,900,000	26
50-99	67	143,100,000	31	38,200,000	181,300,000	12
1-49	28	273,000,000	20	76,800,000	349,800,000	23
Average Total, All Size Groups	71%	$1,233,400,000	31%	$271,900,000	$1,505,300,000	100%

SOURCE: American Machinist/Metalworking Manufacturing

ly expenditure for metal-forming machines is $14.2 million. That is a sharp jump from the monthly average of $10.6 million during 1959 and of $6.2 million in 1958.

Of special significance is the fact that the smallest companies will be making heavier investments, based on the percentage of orders, than any other group. This is in marked contrast with tradition, for normally the big manufacturers with more than 1000 workers each account for as much as three-fourths of Metalworking's investments in capital equipment during any single year. But in the next year-and-a-half the giant companies expect to spend less than one-third (29%) of the $1.5 billion that will be poured out for new machines.

On the other hand, companies with fewer than 500 production workers will spend three out of every five dollars set aside by Metalworking for machine-tool expenditures.

Average expenditure per employee throughout Metalworking will be $233. For each plant that participated in the survey, this investment figure becomes an average of $71,100 for new metal-cutting and metal-forming machines.

Plus and minus factors

These disclosures have both their bright and dark aspects. The fact that so many small manufacturers are ready to make sizable outlays for new production equipment is testimony to widespread confidence in the future health of the metalworking industry. On the other hand, the relatively meager spending planned by the automobile industry augers a continuation of a conservative policy at Detroit that has been prevalent since the lavish investments in the 1955-1957 era.

On the plus side, the level of buying will be high in most industries, compared to 1958 and 1959. The metalworking-machinery industry (which includes machine tool builders) indicates it plans an impressive modernization program. And the aircraft industry (builders of complete aircraft as well as aircraft-parts suppliers) plans to invest heavily in new machine tools, apart from those that the Defense Department may furnish. The same pattern holds true in such polyglot industries as fabricated metal products and general industrial equipment.

Automation rising

The trend to automation will continue, the survey also reveals. Almost 16% of total planned expenditures will go into automated equipment. See p 182 for a detailed report on automation.

The survey also reveals that purchases of foreign-built machine tools will be surprisingly low. Less than three percent of total planned expenditures will be invested by U S metalworking plants in foreign machine tools. For a detailed discussion on planned expenditures for foreign machine tools, see p 180.

A few words of caution

The editors wish to point out that the figures reported to them by 1107 metalworking plants of all sizes represent the plans of the managements of these plants at the time the survey was made. Any plans are subject to change, based on new developments. Should the U S economy go into a tailspin, a most unlikely occurrence, investments would be scaled down accordingly. On the other hand, if the cold war should get warmer (including the possibility of a Russian military base in Castro's Cuba), actual outlays could rise far higher than metalworking managements now plan.

Expanded dollar figures

The tables on these pages represent an expansion of actual returns, based on the theory that, within a given industry, the ratio of expenditures to employees is constant. Each of the fourteen industries presented here was expanded separately, as was each of the sixteen areas discussed on other pages. A few of the plants responding (less than 10%) could not estimate their dollar expenditures. Dollar information is therefore based on 1028 plants (including those that reported no planned expenditures). The other tables in this report are based on all 1107 returns, except where noted.

Tables basis for comparison

With the two tables on these pages, you can compare spending plans with those of companies in your industry and your size group. The tables on the following page will give you figures on dollar spending per plant and per employee.

Industry titles roughly follow those used in the Eighth American Machinist Inventory of Metalworking Equipment (published Nov '58). For a further description of these industries, and the sixteen areas in the area tables, see the last page of this report.

What will the average expenditure be?

AVERAGE EXPENDITURE PER COMPANY—BY INDUSTRY

INDUSTRY	Metal-Cutting Machines		Metal-Forming Machines		Machine-Tool Totals	
	Per Plant	Per Employee	Per Plant	Per Employee	Per Plant	Per Employee
Farm Machinery	$14,950	$ 99	$11,750	$78	$26,700	$177
Construction, Mining, Materials Handling	46,300	118	10,600	27	56,900	145
Metalworking Machinery	95,200	396	4,200	18	99,400	414
Special-Industry Machinery	56,400	304	5,300	28	61,700	332
General Industrial Equipment	53,600	343	3,300	21	56,900	364
Fabricated Metal Products	21,700	177	8,600	70	30,300	247
Office & Service Machines	75,500	177	38,000	89	113,500	266
Electrical Equipment	49,400	117	18,200	43	67,600	160
Communications Equipment	50,200	102	9,100	18	59,300	120
Motor Vehicles & Parts	92,800	160	23,100	40	115,900	200
Aircraft & Aircraft Parts	400,000	191	33,000	16	433,000	207
Precision Mechanisms	33,700	101	5,200	15	38,900	116
Shipbuilding, Ordnance, Railroad Equipment	69,400	67	32,100	31	101,500	98
Forge Shops, Foundries, Misc.	19,600	151	2,900	22	22,500	173
Average, All Industries	$61,200	$192	$ 9,900	$31	$71,100	$223

SOURCE: American Machinist/Metalworking Manufacturing

AVERAGE EXPENDITURE PER COMPANY — BY SIZE

Size of Plant by Employees	Metal-Cutting Expenditures		Metal-Forming Expenditures		Total Machine-Tool Expenditures	
	Per Company	Per Employee	Per Company	Per Employee	Per Company	Per Employee
Over 1000	$400,000	$126	$57,000	$18	$457,000	$144
500-999	130,000	210	22,000	34	152,000	244
100-499	50,000	250	8,300	40	58,300	290
50-99	23,000	380	5,200	85	28,200	465
1-49	12,700	485	2,640	103	15,340	588
Average, 614 Plants	$ 61,200	$192	$ 9,900	$31	$ 71,100	$223

SOURCE: American Machinist/Metalworking Manufacturing

Investment will average $223 per employee

The tables to the left show the average expenditure per company, and per employee, in fourteen industry and five size groups, as reported by the 1028 plants that furnished dollar figures. Close comparison of your plans with those of your industry will reveal how well your modernization program measures up to your competitors'.

Average expenditure per company decreases from $457,000 in the largest plants to $15,340 in the smallest. But the planned investment per employee rises, without exception, as plant size decreases. In fact, plants with 1-49 employees will spend more than four times as much per employee as those with more than 1000 production workers. Here again is convincing proof that smaller plants (those with fewer than 500 production workers) will be a more potent factor in the machine-tool market than larger plants.

The industry table reveals one highly interesting point: Average expenditure per employee for all of Metalworking, $223, is exceeded by only five of the fourteen industry groups. Not one of these groups is *primarily* a highly automated, mass-production industry. Heading the list of high per-employee investors is the metalworking-machinery industry ($414). Average expenditures per employee in two other groups will also be well above the average: general industrial equipment ($364) and special-industry machinery ($332).

The industry table also shows that these three industries will be the heaviest buyers, per employee, of metal-cutting machine tools. On the other hand, their purchases of metal-forming machines will be below the average ($31). Per-employee leader in metal-forming purchases will be the office-and-service-machines industry ($89).

What will be spent in each area?

PLANNED EXPENDITURES — BY AREA

Area	Metal-Cutting Machines: Percent Planning Purchases	Metal-Cutting Machines: Planned Expenditures	Metal-Forming Machines: Percent Planning Purchases	Metal-Forming Machines: Planned Expenditures	Total Planned Expenditures
Boston	80%	$ 74,500,000	20%	$ 7,600,000	$ 82,100,000
Bridgeport-Hartford	77	33,500,000	43	6,900,000	40,400,000
New York-Newark	72	53,700,000	48	12,300,000	66,000,000
Buffalo-Syracuse	69	62,800,000	31	12,900,000	75,700,000
Philadelphia-Camden	70	67,800,000	26	18,500,000	86,300,000
Pittsburgh-Wheeling	67	73,700,000	31	13,500,000	87,200,000
Baltimore Richmond Atlanta-New Orleans	64	62,600,000	27	22,700,000	85,300,000
Cleveland Toledo	65	181,000,000	25	9,900,000	190,900,000
Cincinnati-Louisville	68	46,300,000	32	12,800,000	59,100,000
Detroit	54	111,700,000	22	46,300,000	158,000,000
Indianapolis	72	33,200,000	41	17,200,000	50,400,000
Chicago	78	211,000,000	28	51,200,000	262,200,000
Milwaukee Minneapolis-St. Paul	74	69,500,000	46	11,700,000	81,200,000
St. Louis Kansas City-Tulsa Dallas-Houston	69	19,300,000	36	9,600,000	28,900,000
Denver Seattle-Portland San Francisco	80	19,600,000	44	8,400,000	28,000,000
Los Angeles	68	113,200,000	28	10,400,000	123,600,000
Average/Total, All Areas	71%	$1,233,400,000	31%	$271,900,000	$1,505,300,000

SOURCE: American Machinist/Metalworking Manufacturing

Midwest dominates spending plans

Traditionally the nation's chief machine-tool market, the Midwest once again will be the biggest spender for machine tools. During the next year and a half, the area that includes Ohio, Illinois, Michigan, and Indiana will spend more for machine tools than the rest of the U.S. combined.

Area designations are similar to those that appear in the Eighth Inventory of Metalworking Equipment, except that the breakdown is not so fine. The map on the last page of this report shows the area boundaries.

Almost one of every five dollars (17.4%) for new machine tools will be spent in the Chicago area, which leads all others in planned dollar expenditures. Smallest amount will be spent in the vast area designated Denver, Seattle-Portland, San Francisco, where less than 2% of total nation-wide expenditures will be invested in machine tools.

Because the areas vary so widely in size, it is perhaps more realistic to discuss area expenditures in terms of the dollars per metalworking employee. Here the Cleveland-Toledo area leads the nation: $460 per employee will be spent by plants in this area. Not too far behind is the Pittsburgh-Wheeling area, whose plants will invest $383 per employee in machine tools. The area embracing St. Louis, Kansas City-Tulsa, and Dallas-Houston is the country's lowest; expenditures here will be only $60 per employee.

What machine tools will be bought?

MACHINE TOOL PURCHASE PLANS OF 1028 COMPANIES — BY INDUSTRY

Industry	Size of Sample: Plants	Size of Sample: Employees	Automatic Screw Machines	Boring Machines, Vertical	Boring Machines, Horizontal	Broaching Machines	Cutoff Machines	Drilling Machines	Gear-Cutting Machines	Grinding Machines	Honing & Lapping Machines	Lathes	Milling Machines	Planers	Polishing & Buffing Machines	Shapers	Special Multi-Station Machines	Threading Machines
Farm Machinery	22	3,325	2	1	—	2	10	42	2	3	—	17	6	—	—	—	—	3
Construction, Mining, Materials Handling	56	22,016	8	3	7	2	9	26	3	8	1	28	11	—	4	—	2	5
Metalworking Machinery	160	38,372	26	19	33	3	23	96	23	168	11	163	137	9	2	5	3	9
Special-Industry Machinery	84	15,604	8	10	17	5	7	63	7	32	5	50	48	7	7	—	3	3
General Industrial Equipment	76	11,886	13	4	13	4	5	63	29	32	6	49	22	1	5	2	7	5
Fabricated Metal Products	264	32,508	112	2	10	6	42	121	2	74	5	86	55	5	31	9	27	34
Office & Service Machines	30	12,830	8	2	3	2	4	31	6	20	5	20	27	—	7	1	8	3
Electrical Equipment	76	31,983	26	3	7	2	13	113	4	41	3	81	41	3	9	7	7	5
Communications Equipment	27	13,294	4	1	3	2	—	11	2	12	2	24	18	—	5	—	3	—
Motor Vehicles & Parts	47	27,295	13	5	7	4	19	45	9	32	2	32	21	—	12	1	22	4
Aircraft & Aircraft Parts	35	73,491	6	14	5	7	9	40	10	47	8	62	42	—	25	1	14	3
Precision Mechanisms	41	13,693	30	5	4	6	6	41	8	16	5	36	16	—	8	2	13	8
Shipbuilding, Ordnance, Railroad Equipment	19	19,683	—	6	5	—	5	17	3	6	1	22	12	2	9	3	—	3
Forge Shops, Foundries, Misc.	91	11,794	—	4	8	1	13	56	2	38	11	65	47	1	8	5	14	1
Total, All Industries	1028	327,774	256	79	122	46	165	765	110	529	65	735	503	28	132	36	123	86

SOURCE: American Machinist/Metalworking Manufacturing

1028 companies plan to buy 4701

During the 19-month period between June 1960 and the end of 1961, a total of 4701 machine tools (both cutting and forming types) will be bought by the 1028 companies that furnished purchase plans in the survey. Four-fifths of this total (3780) will be metal-cutting machines; the remaining fifth (921) will be metal-forming units.

Total machine-purchase plans for each of 14 industry groups and five employee size groups appear on these pages. On the following page is an area breakdown.

Predictably, standard machines of the type found in almost every shop will account for the major share of purchases. Four types of standard cutting machines will make up more than half of total purchases: drilling machines (16.2%), lathes (15.6%), grinding machines (11.2%) and milling machines (10.7%). Most popular forming machine in terms of numbers is the mechanical forming press (7% of the total).

The plant-size table shows that plants with 100-499 production workers will buy more machine tools than any other size group—35%. It is interesting to note that the three smallest size groups, consisting of plants with fewer than 500 employees, will buy almost seven out of every ten machines (69%). These groups, it will be remembered, will also spend three out of every five dollars in machine-tool purchases. Any correlation of dollar figures and machine numbers must, however, be made with caution, because prices for individual types of machine tools vary so widely.

Of the industries represented in the survey, the fabricated-metal-products industry leads in total planned machines (974), followed by the metalworking-machinery industry (776). Size of sample, however, is larger in these two industries than in most of the others, a fact that should be remembered when comparisons are made.

Hydraulic Forming Presses	Mechanical Forming Presses	Press Brakes	Punching & Shearing Machines	Forging & Swaging Machines	Wire & Strip Forming Machines	TOTAL MACHINES
2	8	6	39	—	—	107
1	6	8	8	3	—	143
9	25	6	6	—	—	776
3	5	15	12	—	—	307
3	10	7	3	1	1	285
16	149	50	60	10	68	974
2	18	23	18	1	3	212
28	37	26	32	1	5	494
1	4	6	12	1	4	115
13	37	9	5	3	—	295
10	6	5	4	6	1	325
12	12	1	6	—	3	238
3	4	3	11	4	—	119
4	6	7	10	2	8	311
107	327	172	190	32	93	4701

machine tools

As the industry table (above) shows, purchases will not be restricted to one or two industry groups, but will be fairly well spread throughout Metalworking.

Interpreters of these tables will note that, unlike the dollar figures on previous pages, the machine tables have not been expanded. For obvious reasons, such an expansion could lead to very faulty estimates. With the industry table appears a listing that includes the number of plants reporting in each industry, and the number of employees in these plants. This listing, however, is given solely to show the size of the sample in each industry.

PURCHASE PLANS OF 1028 COMPANIES — BY SIZE

Companies Reporting	61	69	351	214	333	1028
Employees	Over 1000	500-999	100-499	50-99	1-49	Total Machines
Automatic Screw Machines	28	24	94	50	60	256
Boring Machines, Vertical	23	11	24	14	5	79
Boring Machines, Horizontal	30	20	35	19	18	122
Broaching Machines	14	4	16	5	7	46
Cutoff Machines	33	17	59	23	33	165
Drilling Machines	139	98	278	133	117	765
Gear-Cutting Machines	35	11	28	26	10	110
Grinding Machines	116	72	155	99	87	529
Honing & Lapping Machines	14	5	24	13	9	65
Lathes	177	64	230	116	148	735
Milling Machines	93	44	187	80	99	503
Planers	2	1	15	5	5	28
Polishing & Buffing Machines	32	18	45	23	14	132
Shapers	3	4	15	6	6	36
Special Multi-Station Machines	44	9	58	8	4	123
Threading Machines	16	8	36	11	15	86
Hydraulic Forming Presses	40	16	37	10	4	107
Mechanical Forming Presses	44	35	95	116	37	327
Press Brakes	20	19	66	31	36	172
Punching & Shearing Machines	37	16	81	34	22	190
Forging & Swaging Machines	10	2	10	5	5	32
Wire & Strip Forming Machines	6	8	61	8	10	93
Totals, All Size Groups	960	506	1649	835	751	4701

SOURCE: American Machinist/Metalworking Manufacturing

MACHINE-TOOL PURCHASE PLANS OF 1028 COMPANIES — BY AREA

Area	Size of Sample: Plants	Size of Sample: Employees	Automatic Screw Machines	Boring Machines, Vertical	Boring Machines, Horizontal	Broaching Machines	Cutoff Machines	Drilling Machines	Gear-Cutting Machines	Grinding Machines	Honing & Lapping Machines	Lathes	Milling Machines	Planers	Polishing & Buffing Machines	Shapers	Special Multi-Station Machines	Threading Machines
Boston	81	25,965	15	10	11	2	10	78	2	46	6	82	60	3	15	3	12	4
Bridgeport-Hartford	42	24,130	22	6	12	1	7	41	8	26	2	55	30	1	2	2	2	3
New York-Newark	79	20,088	20	—	—	5	15	73	1	53	5	66	54	1	11	2	13	9
Buffalo-Syracuse	47	10,232	12	2	7	3	5	22	13	22	4	22	19	—	8	4	3	2
Philadelphia-Camden	71	18,192	6	6	6	4	15	40	10	33	5	51	34	1	4	6	4	6
Pittsburgh-Wheeling	49	12,202	5	4	7	—	6	16	—	20	2	26	13	6	—	1	2	1
Baltimore-Richmond Atlanta-New Orleans	56	11,478	9	1	4	1	13	39	3	23	5	29	29	1	10	—	—	8
Cleveland-Toledo	82	32,377	24	6	22	7	14	70	24	66	9	58	29	1	25	—	24	5
Cincinnati-Louisville	51	18,815	7	4	5	4	7	25	5	23	3	29	15	3	9	1	1	1
Detroit	61	10,137	5	2	4	3	9	14	5	34	2	24	20	—	15	4	3	6
Indianapolis	33	15,112	10	1	7	2	8	30	—	20	2	17	7	—	1	1	9	3
Chicago	149	34,406	51	11	11	4	28	102	17	65	6	100	58	4	3	3	12	9
Milwaukee-Minneapolis-St. Paul	88	29,699	45	12	17	3	12	80	8	34	5	64	44	2	9	5	10	12
St. Louis-Kansas City-Tulsa Dallas-Houston	53	12,665	7	2	3	5	7	53	2	18	5	42	30	1	4	1	12	7
Denver-Seattle-Portland-San Francisco	38	28,020	15	3	2	1	6	39	9	15	2	32	21	4	7	2	1	8
Los Angeles	48	24,256	3	9	4	1	3	43	3	31	2	38	40	—	9	1	15	2
Totals, All Areas	1028	327,774	256	79	122	46	165	765	110	529	65	735	503	28	132	36	123	86

SOURCE: American Machinist/Metalworking Manufacturing

Who will supply the tooling?

SOURCES OF TOOLING—BY INDUSTRY

	Machine Builder	Own Toolroom	Outside Tool Shop
Farm Machinery	22%	67%	11%
Construction, Mining, Materials Handling	43	47	10
Metalworking Machinery	43	48	9
Special-Industry Machinery	41	48	11
General Industrial Equipment	36	55	9
Fabricated Metal Products	34	44	22
Office & Service Machines	17	60	23
Electrical Equipment	28	59	13
Communications Equipment	39	46	15
Motor Vehicles & Parts	29	39	32
Aircraft & Aircraft Parts	32	51	17
Precision Mechanisms	32	54	14
Shipbuilding, Ordnance, Railroad Equipment	56	40	4
Forge Shops, Foundries, Misc.	39	52	9
Average, All Industries	36%	49%	15%

Half of companies

SOURCES OF TOOLING—BY PLANT SIZE

Size of Plant by Employees	Machine Builder	Own Shop	Outside Tool Shop
Over 1000	42%	44%	14%
500-999	31	56	13
100-499	33	53	14
50-99	37	48	15
1-49	40	44	16
Average, All Size Groups	36%	49%	15%

SOURCE: American Machinist/Metalworking Manufacturing

Hydraulic Forming Presses	Mechanical Forming Presses	Press Brakes	Punching & Shearing Machines	Forging & Swaging Machines	Wire & Strip Forming Machines	TOTAL MACHINES
24	15	2	7	2	6	415
4	57	3	3	1	3	291
–	12	29	11	2	2	384
5	7	3	5	–	8	176
8	24	9	11	–	35	318
4	17	5	4	5	6	150
1	15	9	12	2	2	216
9	18	8	15	8	–	442
4	7	9	10	1	1	174
1	47	6	7	1	2	214
10	32	2	8	2	1	173
13	23	25	42	2	26	615
7	32	24	13	4	–	442
5	6	19	14	–	1	244
4	7	15	20	1	–	214
8	8	4	8	1	–	233
107	327	172	190	32	93	4701

East and Midwest will purchase greatest number

To the left is a table that shows machine-tool purchase plans of 1028 companies in sixteen geographic areas. As in the tables on the two previous pages, figures in this area table have not been expanded.

Because the figures in this area table represent a sampling, it would be unwise to consider them representative of Metalworking as a whole. But the area purchase plans *of these 1028 plants only* show that the Midwest and East will buy the greatest number of machine tools.

The first six areas in the table to the left (Boston through Pittsburgh-Wheeling) will buy 1734 machines, or 37% of the total reported. In the South (Baltimore, Richmond, Atlanta-New Orleans), plants that reported will purchase only 5% of the total. Leader in the survey is the Midwest (Cleveland through Milwaukee in the table), which will buy 2060 machines, or 44% of the total. Remaining 14% of machines reported will be bought by plants in states west of the Missisippi River.

The table reveals that purchases are by no means restricted to a few major areas. In fact, the Chicago area, which leads all others in total numbers of planned machines, is the national leader in only six of the 22 different types of machines reported on.

With the area table appears, as with the industry and group-size tables, a listing of the plants in each area that responded to the survey, together with the total production workers in those plants. Here again, this listing is given solely to show the size of the sample in each area, and the reader is urged to resist the temptation to expand the sample to get total figures for all metalworking plants in an area.

will supply own tooling

Almost half (49%) of the companies that are buying new machines will supply the tooling from their own shops. Slightly more than a third (36%) of the plants will rely on the machine builder to furnish tooling. Only 15% will call on an outside tool shop.

The significance of these statistics can be expressed in another way: Only slightly more than one in three plants will call upon the machine builder to furnish the tooling for their new machines.

This ratio among tooling sources has remained fairly constant in recent years. A survey conducted five years ago by AMERICAN MACHINIST/METALWORKING MANUFACTURING, in which the same question was asked, drew the following response: own toolroom—49%; machine builder—34%; outside tool shop—17%.

The two tables to the left show the response by industry and by plant size groups to this question: "Who will supply *most* of the tooling for your new machines?" Many plants use, of course, more than one source, but the editors felt that limiting the question in this way would more sharply define the various sources of tooling.

As the industry table shows, tooling sources vary widely from industry to industry. For example, only 17% of responding plants in the office-and-service-machines industry will call upon the machine builder to furnish tooling. But in shipbuilding, ordnance, and the railroad-equipment industry, this figure rises to 56%.

Similarly, the percentage spread under the tooling source, "Own Toolroom," extends from 39% to 67%. And the range among outside tool shops is from a slight 4% to a sizeable 32%.

From the plant-size table emerges one striking conclusion: The largest plants, which might be expected to supply a major portion of tooling from their own shops, actually will make no more of their tooling than the smallest plants. In fact, the range between size groups, under each tooling source, is perhaps not so great as one might normally expect it to be.

How much for replacement vs expansion?

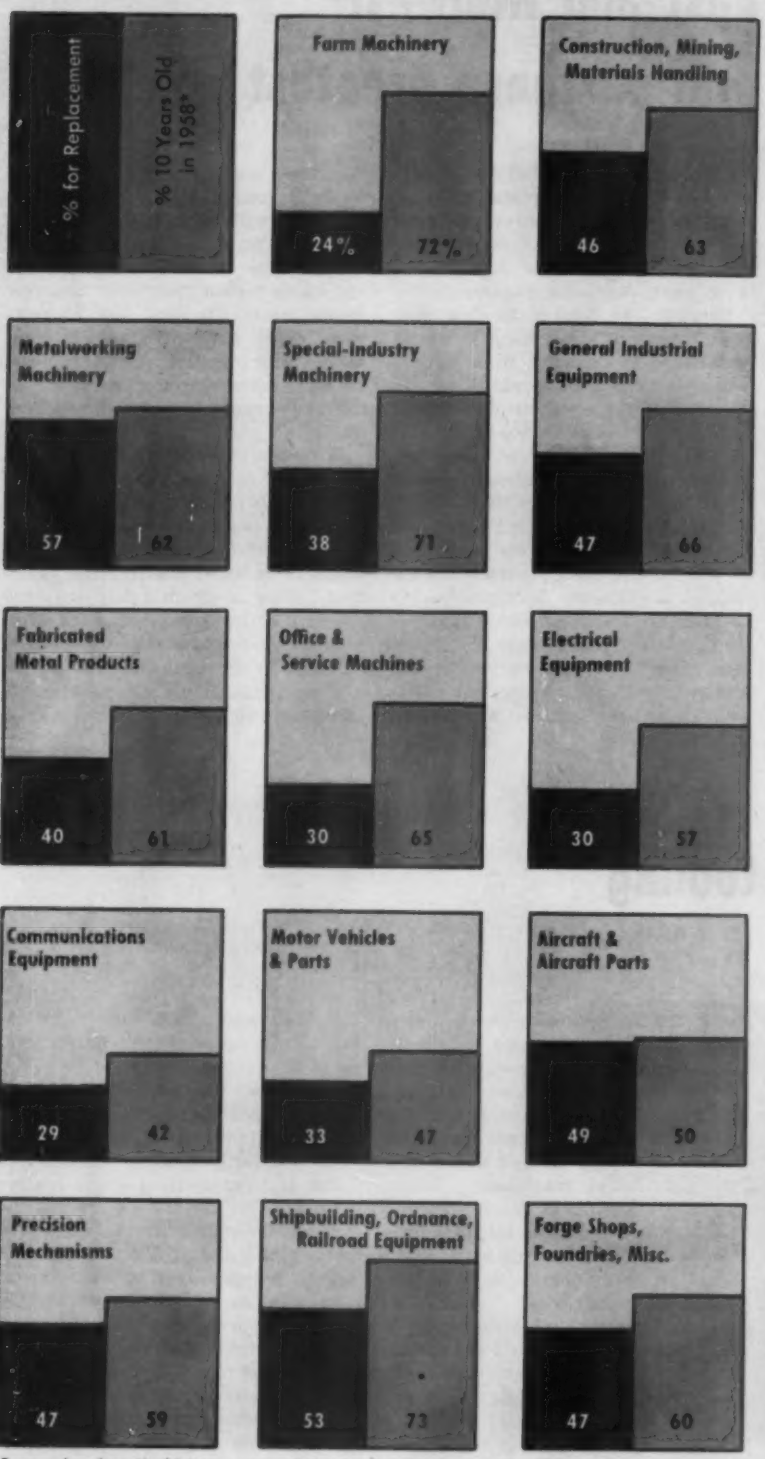
44% of new machines are for replacement

More than four out of every ten new machine tools—44% of total purchases—will replace existing, generally obsolete, machines. The other 56% of planned machines will go into expansion programs.

Replacement means modernization, and the replacement percentage here is impressive. In a similar survey conducted five years ago by this magazine, only 31% of new machines were slated for replacement.

Why this sizeable trend in the direction of modernization? One answer is that plants are not expanding their facilities as much as they were five years ago. But, equally likely, it appears that Metalworking is being forced to modernize its production facilities. As the table below reveals, 60% of the nation's machine tools were at least 10 years old in 1958. Purchase of new machines, with their higher productivity, is more and more becoming a necessity.

Leader in modernization is the metalworking-machinery industry, in which 57% of new machines will go into replacement programs. Last place goes to the communications-equipment industry, which in 1958 had the most up-to-date equipment in Metalworking (only 42% of machines older than 10 years).



*Source: American Machinist Inventory of Metalworking Equipment, Nov 17 '58

What will be spent on manufacturing research?

EXPENDITURES FOR MANUFACTURING RESEARCH—BY INDUSTRY

Industry	Plants With Mfg. Research	Average No. Of People in Mfg. Research	Average Expenditure 1960	1961
Farm Machinery	48%	3.1	$10,400	$11,600
Construction, Mining, Materials Handling	57	2.9	41,800	48,500
Metalworking Machinery	50	3.8	25,900	27,200
Special-Industry Machinery	53	3.8	28,000	31,600
General Industrial Equipment	46	3.6	26,500	31,700
Fabricated Metal Products	47	3.1	22,800	26,300
Office & Service Machines	70	3.5	28,700	25,100
Electrical Equipment	67	4.9	32,000	34,600
Communications Equipment	63	5.2	43,100	50,100
Motor Vehicles & Parts	59	3.4	82,200	97,500
Aircraft & Aircraft Parts	78	11.7	79,000	97,000
Precision Mechanisms	60	7.2	41,600	48,700
Shipbuilding, Ordnance, Railroad Equipment	52	8.6	75,100	84,500
Forge Shops, Foundries, Misc.	44	3.6	23,900	29,100
Average, All Industries	53%	5.2	$33,300	$37,600

SOURCE: American Machinist/Metalworking Manufacturing

EXPENDITURES FOR MANUFACTURING RESEARCH—BY SIZE GROUP

Size of Plant by Employees	Plants with Mfg. Research	Average No. of People in Mfg. Research	Average Expenditure 1960	1961
Over 1000	85%	22	$117,000	$127,000
500-999	67	8	54,000	61,000
100-499	62	3.5	27,500	31,000
50-99	50	2.8	13,200	14,100
1-49	36	2.2	9,100	9,800
Average, All Size Groups	53%	5.2	$ 33,300	$ 37,600

SOURCE: American Machinist/Metalworking Manufacturing

Manufacturing-research programs on the rise

Manufacturing research is a company's usual name for a formal research program in production methods. Such programs have increased steadily since their introduction, not too many years ago, in large companies—notably those in the aircraft industry. Over half (53%) of the companies that responded to this survey stated that they have manufacturing-research programs. Three years ago, in a similar survey, this figure was only 37%.

The tables to the left show manufacturing-research plans, by industry and by size groups, of the 1100-plus plants that filled in and returned the survey questionnaire.

Tabulations show that, in plants with manufacturing-research programs, an average of 5.2 people is employed full-time in this work. As might be expected, MR staffs are largest in the aircraft industry (an average of 11.7 people per plant). But averages are high in two other industries: Shipbuilding, ordnance, and railroad equipment has an average of 8.6 MR workers a plant; and each precision-mechanism plant employs an average of 7.2 MR workers. (These figures apply only to those plants that have manufacturing-research programs—not to the plants that answered "No" in the survey.)

Expenditures per plant, a respectable $33,300 this year, on the average, will rise to $37,600 in 1961. Highest spenders here will be the automotive and aircraft industries.

The size-group table reveals that plants with more than 1000 employees will spend more per plant, on the average, than all other size groups (plants with fewer than 1000 workers) combined. Such a ratio in spending plans is predictable. What is interesting, however, is the extent to which smaller companies have recognized the value of manufacturing-research programs.

What will be spent for foreign machines?

Foreign-machine purchases will be small

During the next year and a half, slightly more than one in twenty plants will buy at least one foreign-built machine tool. But these foreign machines will account for less than 3% of total expenditures by Metalworking for machine tools.

On these two pages appear industry, area, and size-group tables that show the distribution of planned foreign-machine spending.

Foreign-machine statistics in the current survey are especially interesting, in comparison with AMERICAN MACHINIST/METALWORKING MANUFACTURING'S survey of 1959, "Foreign Machine Tools in U S Metalworking." Published about sixteen months ago (April 20, 1959), this unprecedented report established that one of every four U S metalworking plants has foreign-built machine tools. Another significant finding of this 1959 survey: 60% of reported foreign machines had been bought within the past five years. A clear implication of this 1959 foreign-machine survey was that machine-tool imports are rising, both in numbers and in dollar expenditures. But the present survey contradicts this assumption.

INDUSTRY SPENDING PLANS, FOREIGN MACHINE TOOLS

Industry	% of Plants Buying Foreign Machine Tools	% of Total Machine-Tool Expenditures
Farm Machinery	4.5%	1.0%
Construction, Mining Materials Handling	1.8	3.5
Metalworking Machinery	7.5	2.4
Special-Industry Machinery	7.1	2.8
General Industrial Equipment	9.2	2.8
Fabricated Metal Products	7.6	3.9
Office & Service Machines	6.7	1.6
Electrical Equipment	9.2	1.2
Communications Equipment	3.7	0.5
Motor Vehicles & Parts	4.2	1.3
Aircraft & Aircraft Parts	2.0	1.9
Precision Mechanisms	4.9	7.9
Shipbuilding, Ordnance, Railroad Equipment	15.8	2.5
Forge Shops, Foundries, Misc.	7.7	9.4
Average, All Industries	5.6%	2.8%

SOURCE: American Machinist/Metalworking Manufacturing

No increase in imports

Close comparison of the current survey with that of 1959 leads to one salient conclusion: Foreign-machine imports are not now, and will not be in the near future, a substantial percentage of total planned machine tools. As the industry table to the left shows, only 2.8% of planned spending will be invested in foreign machine tools. In 1959 this figure was slightly higher: 4%.

Although both these surveys represent samples only—not projections that cover all of Metalworking—they are substantial samples. And the findings of each are similar: Foreign-machine purchases are and will be small, compared to purchases of U S-built machines. Actually, the current survey shows a slight decrease in planned purchases of these machines, compared to plans for 1959. Even if this decrease does not occur, it is evident that purchase of imports is not likely to increase substantially during the next year and a half.

Machines to be bought

Of the 4701 machine tools that 1028 companies are planning to buy before the end of 1961, 161 (or 3.4%) will be foreign-built machine tools (see area table). No single type of machine tool predominates, although, as might be expected, Swiss automatic screw machines and German gear-hobbing machines are high on the list of individual totals. A good percentage of planned foreign machines consists of relatively inexpensive drilling and grinding machines.

More plants (15.8%) in the shipbuilding, ordnance, and railroad-equipment industry will buy foreign machine tools than in any other industry. But the greatest percentage of total planned expenditures (9.4%) will be in the industry group that consists of forge shops, foundries, and miscellaneous metalworking shops.

The plant-size table reveals that, without exception, the larger the

percentage of total expenditures

FOREIGN-MACHINE EXPENDITURES BY PLANT SIZE

Size of Plant by Employees	% of Plants Buying Foreign Machine Tools	% of Total Machine-Tool Expenditures	Plants That Will Buy Foreign Machines	
			Average Per Plant	Average Expenditure Per Plant
Over 1000	8.2%	2.1%	4.8	$52,700
500-999	7.2	3.2	4.6	50,800
100-499	6.3	2.7	2.0	30,000
50-99	5.1	5.6	3.0	28,000
1-49	4.8	3.1	1.9	10,700
Average, All Sizes	5.6%	2.8%	2.6	$31,300

size of plant, the greater the percentage of plants that plan to buy foreign machines. But, significantly, in the largest size group (1000 and more employees), the foreign-to-total expenditure ratio is the lowest (2.1%) of all size groups. Average expenditure among plants that will buy foreign machine tools is highest, however, in this largest plant size: $52,700. In Metalworking as a whole, average expenditure (for plants that will actually buy these foreign machines) is $31,300 per plant for an average of 2.6 foreign machines.

Interestingly, plants with 50-99 employees will be spending the greatest percentage of total expenditures for these foreign machines. This percentage, 5.6%, is exactly twice as great as that for all Metalworking.

Purchases by area

According to the area table, greatest concentration of foreign-machine purchases will be in plants on the East Coast, extending from New England to New York, where as many as six machines out of every hundred will be imports. But the Los Angeles area leads all others on an individual basis: 6.4 foreign machines out of every hundred planned ones.

Greatest number of reported foreign purchases was from plants in the Chicago area; but here only 3.3 machines out of every hundred planned will be foreign-built. Smallest foreign-to-total ratio reported was from plants in the Cincinnati-Louisville area (only 0.6%), followed closely by the Pittsburgh-Wheeling and Detroit areas.

FOREIGN-MACHINE PLANS OF 1028 COMPANIES — BY AREA

Areas	Total Machines Planned	Foreign Machines Planned	Percentage, Foreign To Total
Boston	415	25	6.0%
Bridgeport-Hartford	291	15	5.2
New York-Newark	384	20	5.2
Buffalo-Syracuse	176	9	5.1
Philadelphia-Camden	318	6	1.9
Pittsburgh-Wheeling	150	1	0.7
Baltimore, Richmond, Atlanta-New Orleans	216	8	3.7
Cleveland, Toledo	442	17	3.9
Cincinnati-Louisville	174	1	0.6
Detroit	214	2	0.9
Indianapolis	173	4	2.3
Chicago	615	20	3.3
Milwaukee, Minneapolis-St. Paul	442	6	1.4
St. Louis, Kansas City-Tulsa, Dallas-Houston	244	4	1.6
Denver, Seattle-Portland, San Francisco	214	8	3.7
Los Angeles	233	15	6.4
Total/Average, All Areas	4701	161	3.4%

SOURCE: American Machinist/Metalworking Manufacturing

What will be spent for automated equipment?

Survey shows that use of automated machines

PERCENT OF TOTAL EXPENDITURES FOR AUTOMATED EQUIPMENT

Size of Plant by Employees	Metal-Cutting Machine Tools	Metal-Forming Machine Tools	Total Machine Tools
Over 1000	15.4%	2.3%	17.7%
500-999	14.5	2.1	16.6
100-499	13.3	1.9	15.2
50-99	8.0	3.1	11.1
1-49	8.7	2.0	10.7
Average, All Size Groups	13.6%	2.2%	15.8%

SOURCE: American Machinist/Metalworking Manufacturing

HOW AUTOMATION AFFECTS LABOR AND MAINTENANCE

Effect of Installing Automated Equipment	Percent of Plants With Automation
Increased maintenance force	17%
Require maintenance force with more skill	45
Require maintenance force with less skill	4
Increased tool or methods engineering staff	21
Increase in toolroom employees	15
Require operators with more skill	24
Require operators with less skill	27
Increased setup force	13

SOURCE: American Machinist/Metalworking Manufacturing

Automation is making steady and impressive gains in the nation's metalworking plants. Almost one-fourth (24%) of the 1107 plants that responded to the survey now have some kind of automated equipment at work. Three years ago the ratio was less than one-fifth (19%).

Of special significance is the fact that the smaller-size plants are increasing the amount of automated machines in their shops. Today more than half (53%) of the plants with 500 to 999 employees have some form of automated equipment. This represents a sharp jump from 35% in 1957. Even in plants with fewer than 500 workers, the percentage with automation has gone up considerably.

Spending plans

Plants that responded to the survey will spend, on the average, 15.8% of total dollars for machines with some form of automation during the period June 1, 1960—December 31, 1961. The table to the left shows this percentage for each of five plant-size groups.

Predictably, the largest plants will be spending the largest percentage of total expeditures (17.7%) for automated equipment. But the smallest plants will spend, on the average, 10.7% of their total dollars for automation. The percentage range between plant sizes is not so great as in some previous years, when large plants in the automotive industry were buying the lion's share of automated equipment being built.

Bulk of dollars-for-automation will go into metal-cutting machines, which account for 13.6% of total machine-tool expenditures. The equivalent figure for metal-forming machines is 2.2%. Worth noting here is that the larger the plant, the greater the share of planned expenditures that will be used for automation.

Three years ago, a special survey on automation by this magazine revealed that the largest size group planned to spend a staggering 36% of machine-tool expenditures for automated equipment. This figure dwarfed equivalent percentages for the four smaller size groups. (See "The Impact of Automation," *AM/MM*—Oct 21 '57).

is increasing rapidly

The expenditure table for the present survey shows that, for plants with more than 1000 employees, this percentage will be roughly halved during the next year and a half. Most of this sizeable drop can be explained, of course, by the curtailment of planned spending in the automotive industry.

In the four smallest size groups, on the other hand, percent of total spending for automation is up several percentage points, compared to three years ago.

Types of equipment

What kinds of automated equipment are found in Metalworking? Here is a representative breakdown, showing the percentage of each type in 267 plants (those that reported having automation):

- Machine tools with automatic loading and unloading: 41%
- Presses with automatic loading and unloading: 32%
- Transfer machines: 25%
- Automatic painting lines: 19%
- Automatic assembly lines: 17%
- Transfer devices between machine tools: 13%
- Transfer devices between presses: 10%
- Automatic plating lines: 10%
- In-process automatic gaging: 9%
- Automatic heat-treating lines: 7%
- Automatic welding lines: 6%
- Machines with feedback: 4%
- Automatic in-process storage units: 2%
- Automatic brazing lines: 2%
- Automatic forging lines: 1%

The 267 plants reported a total of 528 units of automated equipment, or roughly two per plant.

The above percentage figures, though based upon a sampling, probably do show the approximate distribution of the various types of automated equipment throughout all plants with automation.

Why install automation?

Chief reason for installing automation was to reduce direct-labor costs. This was the answer given by 69% of the companies with automated equipment that responded to the survey (see chart). Some 53% of plants also bought automation to increase product output, and 39% report that their investment was made to improve product quality. Only 1% installed automation to meet a labor shortage.

Because plants with more than one type of automated equipment may have more than one chief reason for installing automation, the above figures do not, of course, add up to 100%. The percentages, however, do point out the reasons why companies invest in automated equipment.

Influence on work force

The chart on the opposite page (below, left) reveals that, in Metalworking as a whole, there is considerable difference of opinion on some aspects of the way that automation affects employment.

24% of responding plants reported that their automated equipment requires operators with more skill than in pre-automated days. But 27% reported that they required operators with less skill.

About maintenance, however, there is little doubt: 45% of plants with automation require a maintenance force with more skill; only 4% stated that this force need be less skillful.

Here again, as in the question on reason for installation, the questionnaire invited each plant to check more than one reason if necessary. Thus the percentages on this chart will not total 100%.

WHY WAS AUTOMATED EQUIPMENT INSTALLED?

	Percent of Companies With Automated Equipment
Reduce direct-labor costs	69%
Improve product quality	39%
Increase output	53%
Meet labor shortage	1%

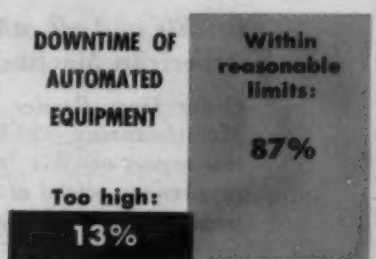
SOURCE: American Machinist/Metalworking Manufacturing

Percent of downtime

By a large margin (87%), plants with automation feel that downtime of their equipment is within reasonable limits. Only 13% feel that it has been excessive.

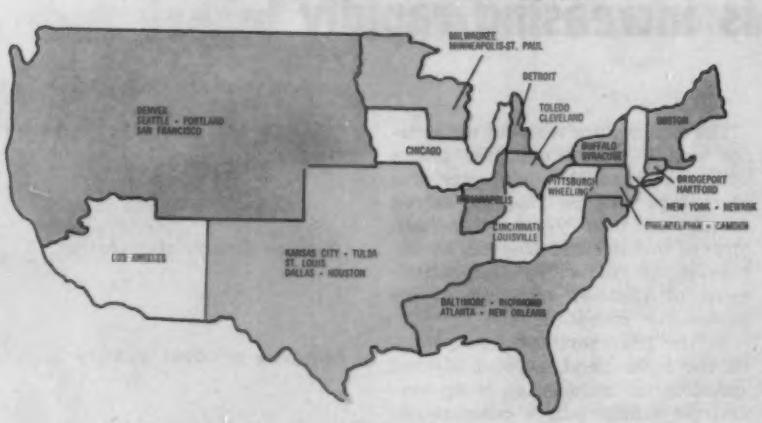
Individual answers on downtime (not including initial debugging and installation time) vary widely. Some plants report downtime as high as 40%; others reported that it is negligible.

Almost as varied are the opinions on whether a specific percentage of downtime is within reasonable limits or is excessive. A few plants consider downtime as high as 20% to be within reasonable limits. On the other hand, some plants feel that a downtime of 5% is excessively high. Reasoning here is obviously based upon the type of automated equipment in question, and the effect that downtime has on the normal processes of production.



Healthy response to survey

AREAS COVERED BY THE SURVEY



To make its survey, AMERICAN MACHINIST/METALWORKING MANUFACTURING mailed out questionnaires to more than 5000 representative metalworking plants in fourteen industry groups spread widely throughout the country. The 1107 companies that responded give a rate of return—over 20%—that must be considered high for any survey. Thus the survey is far more than a random sampling.

Although it is possible that spenders are more likely to respond to surveys than non-spenders, it is equally true that the more representative the response, the more accurate the survey. The high rate of return, and the widespread representation by key companies in all industries, make the survey figures as accurate as possible, in the opinion of the editors.

In the survey, industry groups are classified according to principal products, as established in the *Standard Industrial Classification Manual*, published by the Bureau of the Budget. Latest edition, which appeared in 1957, was used to classify each plant by its principal product. The table to the right gives the SIC number that governs each industry group covered by the survey. The same type of classification was used in this magazine's *Eighth Inventory of Metalworking Equipment*,* published in November, 1958.

Areas covered in the survey also follow the *Inventory* areas, except that some have been combined. The map on this page shows the boundaries of each of the sixteen areas in the survey.

INDUSTRIES COVERED BY THE SURVEY

INDUSTRY	SIC NUMBER
Farm Machinery	352
Construction, Mining, Materials Handling Equipment	353
Metalworking Machinery	354
Special-Industry Machinery	355
General Industrial Equipment	351, 356
Fabricated Metal Products	34
Office & Service Machines	357, 358
Electrical Equipment	361, 362, 363, 364, 369
Communications Equipment	365, 366, 367
Motor Vehicles & Parts	371, 375, 379
Aircraft & Aircraft Parts	372
Precision Mechanisms	38
Shipbuilding, Ordnance, Railroad Equipment	19, 373, 374
Forge Shops, Foundries, Misc.	332, 336, 339, 25, 359, 39

*Copies of the 96-page Eighth Inventory are available from Reader Service Dept, American Machinist/Metalworking Manufacturing, 330 W 42nd St, New York 36, NY, at $2 each.

REPRINTS ARE AVAILABLE

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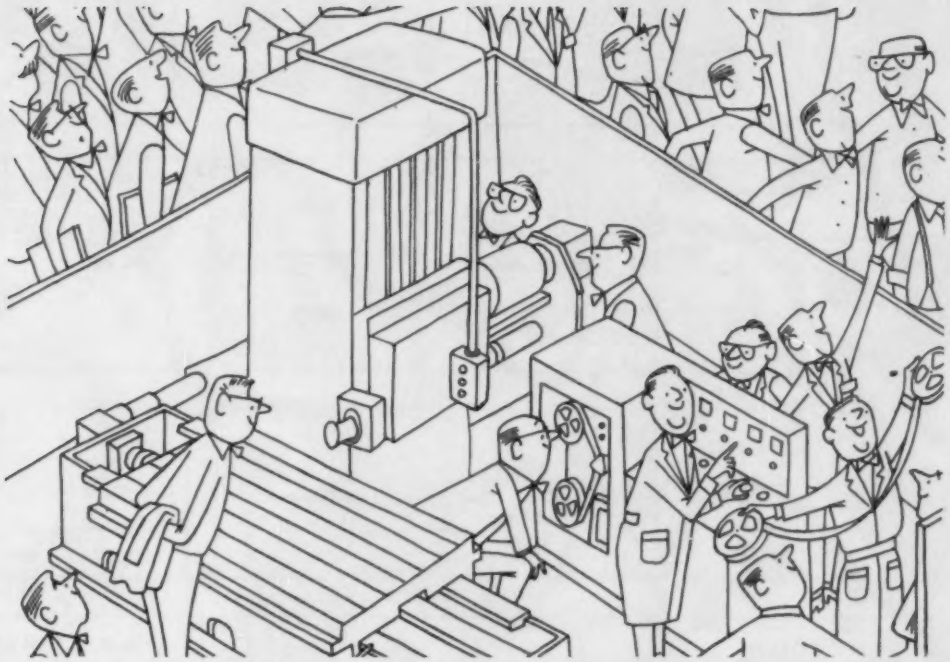
Order from Reader Service Dept., American Machinist/Metalworking Manufacturing, 330 W. 42nd St., New York 36, N. Y. Single copies of this report are 35¢; prices are reduced for quantities over 100. Other reports are priced at 35¢ if 16 pages, 30¢ if 12 pages, and 25¢ if 8 pages. A list of current reprints is available from Reader Service Dept.



MACHINE TOOL EXPOSITION IN PRINT

International Amphitheatre, 43d & Halsted Streets, Chicago, Illinois September 6 to 16, 1960, 10:00 am to 5:30 pm (closed Sunday)

Numerical control is in the limelight (see special table listing numerically controlled machines that follows), but this first industry-wide showing of machine tools since 1955 also features machines with impressive improvements in power and reliability, and new "compact" types for light-duty work.

HOW TO GET TO THE MACHINE TOOL EXPOSITION:

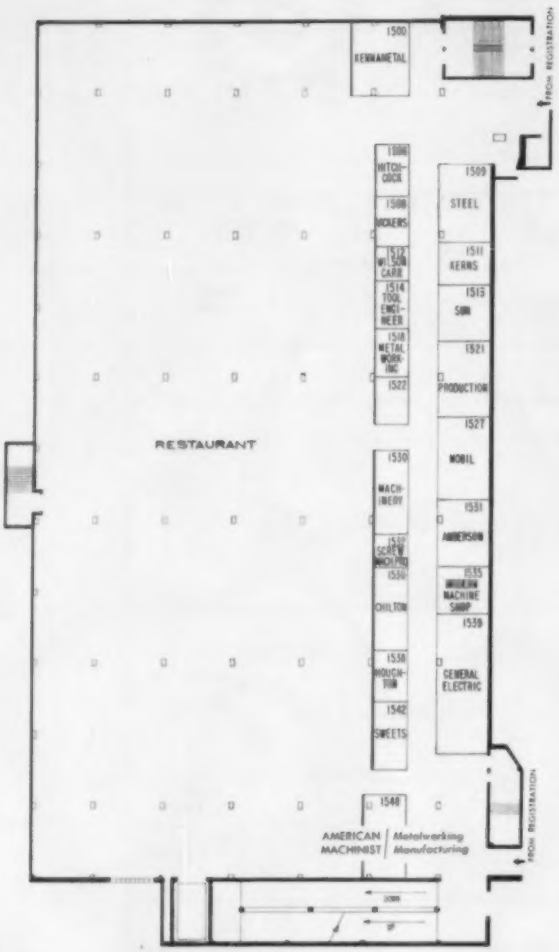
BUS: Special non-stop buses operate to the Amphitheatre from the principal Loop hotels, and from the Production Engineering Show. They also operate from the Amphitheatre to Midway and O'Hare airports. Bus No. 44 travels south on State St through the Loop to the Amphitheatre, Mondays through Fridays.

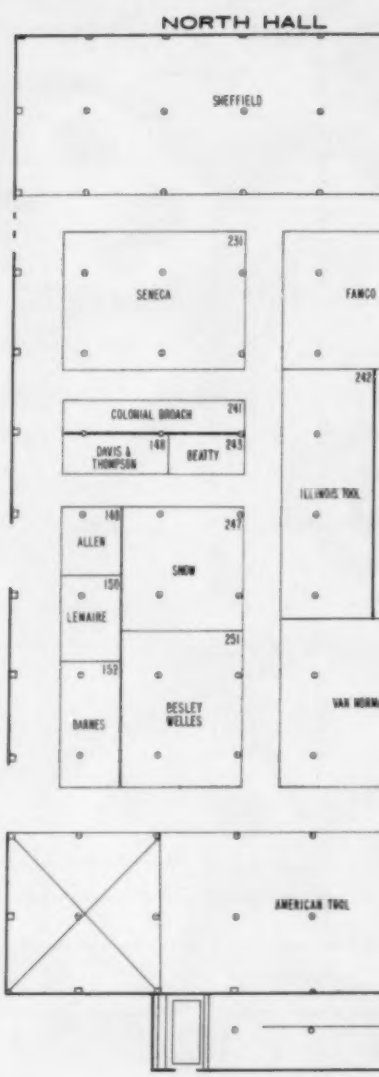
PRIVATE CAR: Drive south on Michigan Ave or State St to 39th St (Pershing Rd), turn right (west) on Pershing Rd to Halsted St, and left (south) on Halsted to parking lots south and west of Amphitheatre.

SUBWAY: Take any southbound State Street Subway train "A" or "B" south to 43rd St (next stop past Indiana Ave) and transfer to westbound bus No. 43 which stops at Amphitheatre. During morning and evening rush hours (Mon to Fri) you can get off at Indiana Ave and take a Stockyards bus. Get transfer at time fare is paid in subway station and validate (time stamp) in elevated station after leaving train.

American Machinist / ***Metalworking Manufacturing***

PULL OUT FOR FLOOR PLAN AND LIST OF EXHIBITORS →





List of Exhibitors

148 Chas G Allen Co
Barre, Mass

1120 American Gage & Machine Co
Size Control & Walsh Press & Die Div
Chicago, Ill

1548 "American Machinisht/Metal-working Manufacturing"
New York 36, N Y

1406 American Steel Foundries
Elmes & King Divisions
Cincinnati 29, Ohio

381 American Tool Works Co
Cincinnati 2, Ohio

1531 F E Anderson Oil Co
Portland, Conn

1340 Armstrong-Blum Mfg Co
Chicago 39, Ill

543 Atlantic Machine Tool Works, Inc
Newington, Conn

1142 The Baird Machine Co
Stratford, Conn

1226 Baldwin-Lima-Hamilton Corp
Hamilton, Ohio

923 Barber-Colman Co
Rockford, Ill

741 Bardons & Oliver, Inc
Cleveland 13, Ohio

641 W F & John Barnes Co
Rockford, Ill

641 John S Barnes Corp
Rockford, Ill

152 Barnes Drill Co
Rockford, Ill

243 Beatty Machine & Mfg Co
Hammond, Ind

251 Besly-Welles Corp
South Beloit, Ill

1209 The Blanchard Machine Co
Cambridge 39, Mass

1325 E W Bliss Co
Canton 10, Ohio

828 Bodine Corp
Bridgeport 5, Conn

452 Brown & Sharpe Mfg Co
Providence, R I

936 Bryant Chucking Grinder Co
Springfield, Vt

551 Buffalo Forge Co
Buffalo 5, N Y

1440 Buhr Machine Tool Co
Ann Arbor, Mich

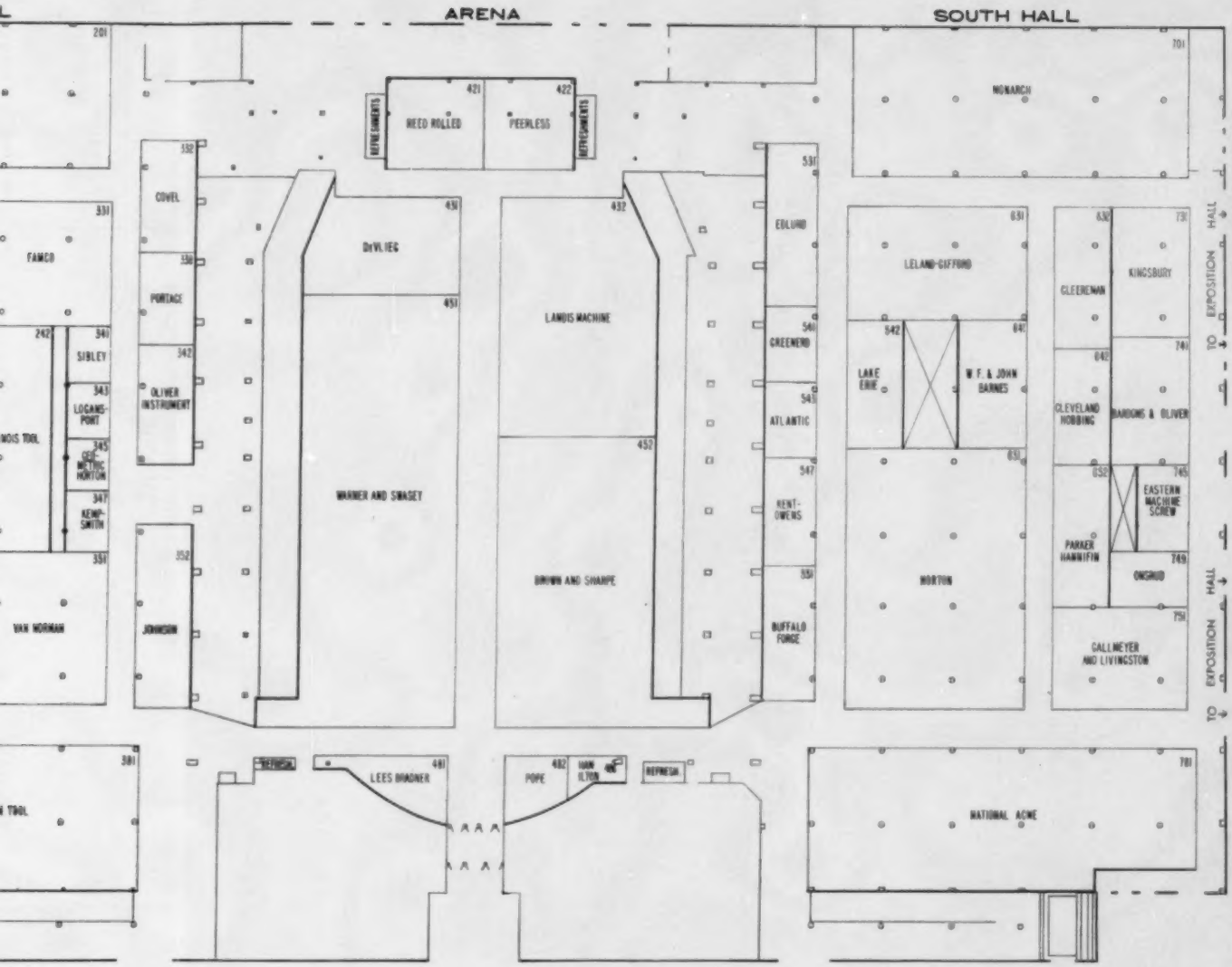
834 Burg Tool Mfg Co, Inc
Gardena, Calif

849 The Carlton Machine Tool Co
Cincinnati 25, Ohio

1536 Chilton Publishing Co, Inc
Philadelphia, Pa

1326 The Cincinnati Gilbert Machine Tool Co
Cincinnati 23, Ohio

934 Cincinnati Lathe & Tool Co
Cincinnati 9, Ohio



928 The Cincinnati Milling Machine Co, Cimtrol Div
Cincinnati 9, Ohio

1034 The Cincinnati Milling Machine Co, Mach Tool Div
Cincinnati 9, Ohio

1027 The Cincinnati Milling Machine Co, Products Div
Cincinnati 9, Ohio

1230 The Cincinnati Shaper Co
Cincinnati 11, Ohio

632 Cleereman Machine Tool Corp
Green Bay, Wis

900 The Cleveland Automatic Machine Co
Norwood, Cincinnati 12, O

814 The Cleveland Crane & Engineering Co
Wickliffe, Ohio

642 Cleveland Hobbing & Machine Co, Div of Textron, Inc
Cleveland 17, Ohio

241 Colonial Broach & Machine Co
Detroit 13, Mich

1215 Cone Automatic Machine Company, Inc
Windsor, Vt

332 Covel Manufacturing Co
Benton Harbor, Mich

1250 Danly Machine Specialties, Inc
Chicago 5, Ill

146 Davis & Thompson Co
Milwaukee 18, Wis

914 Denison Engineering Div, American Brake Shoe Co
Columbus 16, Ohio

1126 Dept of Commerce
Washington, DC

431 DeVlieg Machine Company
Royal Oak, Michigan

1134 Dreis & Krump Manufacturing Co
Chicago 36, Ill

745 The Eastern Machine Screw Corp
New Haven 6, Conn

531 Edlund Machinery Co, Div of Bradley-Edlund Corp
Cortland, N Y

846 Ekstrom, Carlson & Co
Rockford, Illinois

1406 Elmes Engineering Div
American Steel Foundries
Cincinnati 29, Ohio

946 Ex-Cell-O Corp
Detroit 32, Mich

331 Famco Machine Co
Kenosha, Wis

929 The Fellows Gear Shaper Co
Springfield, Vt

1122 Ferracute Machine Co
Bridgeton, N J

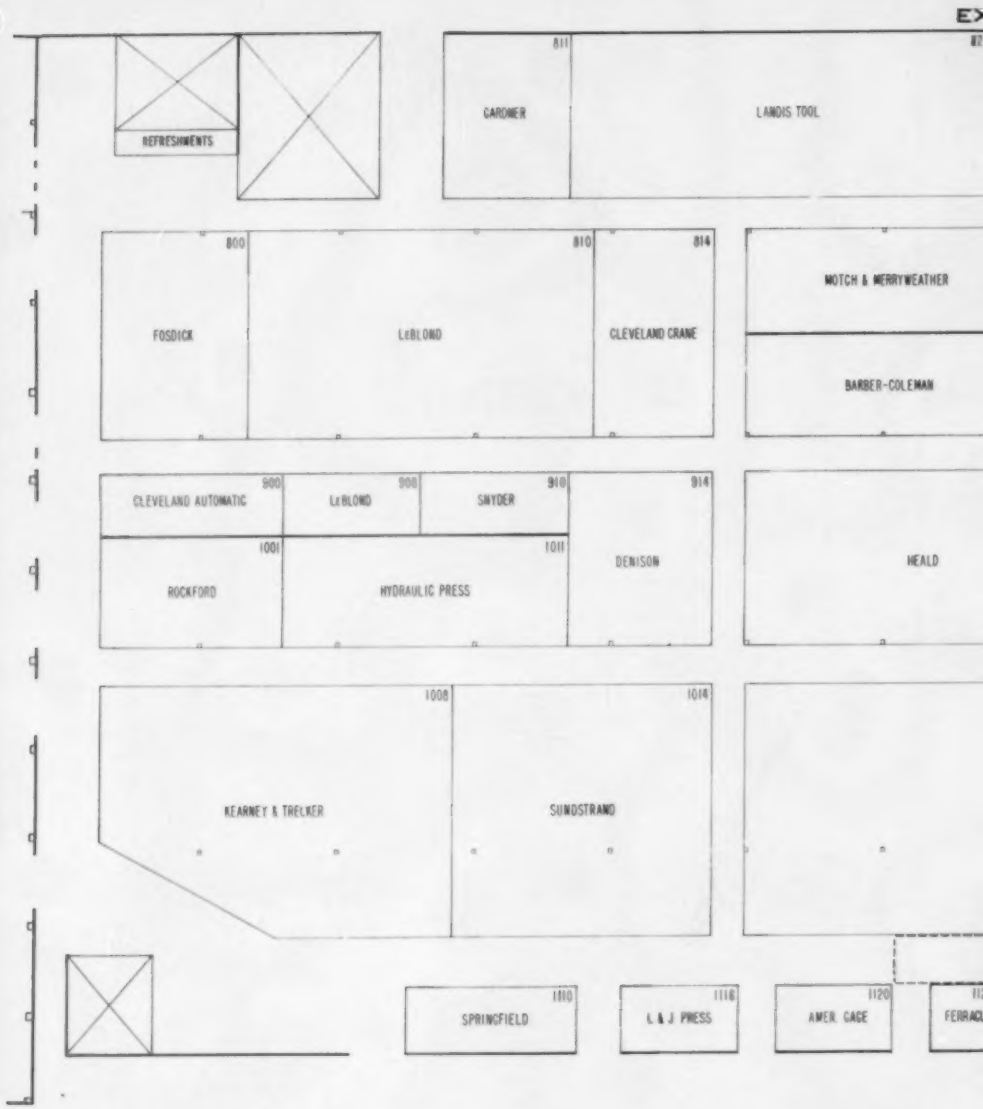
800 Fosdick Machine Tool Co
Cincinnati 23, Ohio

1220 Frauenthal Div, The Kaydon Engineering Corp
Muskegon, Mich

751 Gallmeyer & Livingston Co
Grand Rapids 2, Mich

811 Gardner Machine Company
Beloit, Wis

1539 General Electric Co
Detroit, Mich



List of Exhibitors

345 Geometric Tool Co, Div of United-Greenfield Corp
New Haven 15, Conn

1320 Giddings & Lewis Machine Tool Co
Fond du Lac, Wis

1042 Gisholt Machine Co
Madison 10, Wis

1350 The G A Gray Co
Cincinnati 7, Ohio

1439 Greaves Machine Tool Div, J A Fay & Egan Co
Cincinnati 2, Ohio

541 Greenerd Arbor Press Co
Nashua, N H

486 The Hamilton Tool Co
Hamilton, Ohio

652 Hannifin Co, A Div of Parker-Hannifin Corp
Des Plaines, Ill

924 The Heald Machine Co
Worcester 6, Mass

1240 The Hill Acme Co
Cleveland 2, Ohio

1506 Hitchcock Publishing Co
Wheaton, Ill

1538 E F Houghton & Co
Philadelphia, Pa

1011 The Hydraulic Press Mfg Co, A Div of Koehring Co
Mount Gilead, Ohio

242 Illinois Tool Works
Chicago 39, Ill

352 Johnson Machine & Press Corp, Div of Bontrager Corp
Elkhart, Ind

839 Jones & Lamson Machine Co
Springfield, Vt

1008 Kearney & Trecker Corp
Milwaukee 14, Wis

347 The Kempsmith Machine Co
Milwaukee 14, Wis

1500 Kennametal Inc
Latrobe, Pa

547 Kent-Owens Machine Co
Toledo 10, Ohio

1406 King Machine Tool Div American Steel Foundries
Cincinnati 29, Ohio

731 Kingsbury Machine Tool Corp
Keene, N H

824 W. B. Knight Machinery Co
St Louis 8, Mo

1116 L & J Press Corp
Elkhart, Ind

INTER

542 Lake Erie Machinery Corp
Buffalo 17, N Y

432 Landis Machine Co
Waynesboro, Penn

823, 825 Landis Tool Co
Waynesboro, Penn

1229 The Lapointe Machine Tool Co
Hudson, Mass

810, 908 The R K LeBlond Machine Tool Co
Cincinnati 9, Ohio

481 The Lees-Bradner Co
Cleveland 11, Ohio

631 Leland-Gifford Co
Worcester 1, Mass

150 LeMoire Machine Tool Co
Dearborn, Mich

1046 The Lodge & Shipley Co
Cincinnati 25, Ohio

343 Logansport Machine Co, Inc
Logansport, Ind

838 Lucas Div of New Britain Machine Co
New Britain, Conn

1530 "Machinery"
New York, N Y

1206 Mattison Machine Works
Rockford, Ill

1548 McGraw-Hill Book Co
New York 36, N Y

1518 "Metalworking"
Boston, Mass

945 Michigan Tool Co
Detroit 12, Mich.

1225 Micromatic Hone Corp
Detroit 38, Mich

1522 "Mill & Factory"
New York 17, NY

1339 Minster Machine Co
Minster, Ohio

1527 Socony Mobil Oil Co
New York 17, NY

1535 "Modern Machine Shop"
Cincinnati, Ohio

701 The Monarch Machine Tool Co
Sidney, Ohio

1445 Morris Machine Tool Co
Cincinnati 2, Ohio

1050 Morton Manufacturing Co
Muskegon Heights, Mich

822 The Motch & Merryweather Machinery Co
Cleveland 17, Ohio

781 The National Acme Co
Cleveland 8, Ohio

1205 National Automatic Tool Co, Inc
Richmond, Ind

1430 National Broach & Machine Co
Detroit 13, Mich

1319 Nebel Machine Tool Corp
Cincinnati 25, Ohio

838 The New Britain Machine Co
New Britain, Conn

1330 Niagara Machine & Tool Works
Buffalo 11, NY

651 Norton Co
Worcester 6, Mass

342 Oliver Instrument Co
Adrian, Mich

749 Onsrud Machine Works, Inc
Chicago 31, Ill

achinery Corp
N Y

hine Co
o, Penn

Tool Co
o, Penn

e Machine Tool Co
ss

K LeBland
Tool Co
, Ohio

adner Co
1, Ohio

ord Co
, Mass

chine Tool Co
Mich

& Shipley Co
5, Ohio

343 Logansport Machine Co, Inc
Logansport, Ind

838 Lucas Div of New Britain Machine Co
New Britain, Conn

1530 "Machinery"
New York, N Y

1206 Mattison Machine Works
Rockford, Ill

1548 McGraw-Hill Book Co
New York 36, N Y

1518 "Metalworking"
Boston, Mass

945 Michigan Tool Co
Detroit 12, Mich.

1225 Micromatic Hone Corp
Detroit 38, Mich

1522 "Mill & Factory"
New York 17, NY

1339 Minster Machine Co
Minster, Ohio

1527 Socony Mobil Oil Co
New York 17, NY

1535 "Modern Machine Shop"
Cincinnati, Ohio

701 The Monarch Machine Tool Co
Sidney, Ohio

1445 Morris Machine Tool Co
Cincinnati 2, Ohio

1050 Morton Manufacturing Co
Muskegon Heights, Mich

822 The Motch & Merryweather Machinery Co
Cleveland 17, Ohio

781 The National Acme Co
Cleveland 8, Ohio

1205 National Automatic Tool Co Inc
Richmond, Ind

1430 National Broach & Machine Co
Detroit 13, Mich

1319 Nebel Machine Tool Corp
Cincinnati 25, Ohio

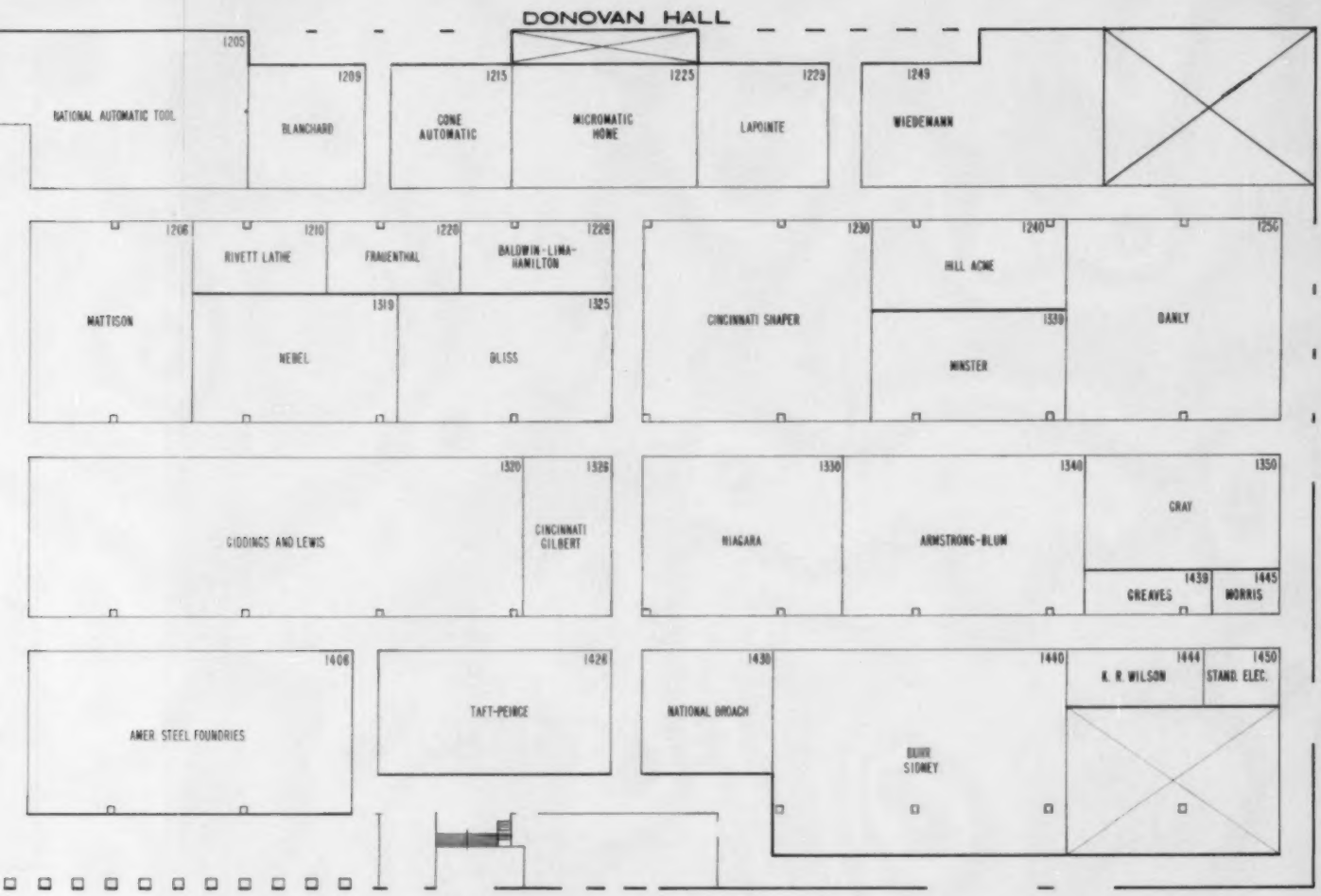
838 The New Britain Machine C
New Britain, Conn

1330 Niagara Machine & Tool Works
Buffalo 11, NY

651 Norton Co
Worcester 6, Mass

342 Oliver Instrument Co
Adrian, Mich

749 Onsrud Machine Works, Inc
Chicago 31, Ill



1960 MACHINE TOOL SHOW

INTERNATIONAL AMPHITHEATRE • CHICAGO • September 6 to 16

Tool Co,

Machine

Corp

achine Co

Tool

rks, Inc

1136 Parker-Majestic, Inc
Detroit 7, Mich

422 Peerless Machine Co
Racine, Wis

482 Pope Machinery Corp
Haverhill, Mass

338 The Portage Machine Co
Akron 11, Ohio

1521 "Production"
Birmingham, Mich

421 Reed Rolled Thread Die Company
Holden, Mass

1210 Rivett Lathe & Grinder, Inc
Brighton, Boston 35, Mass

1001 Rockford Machine Tool Co
Rockford, Ill

231 Seneca Falls Machine Co
Seneca Falls, NY

201 The Sheffield Corp
Dayton 1, Ohio

341 Sibley Machinery & Foundry Corp
South Bend 23, Ind

1440 Sidney Machine Tool Co, Inc
Sidney, Ohio

1120 Size Control Div of American Gage & Machine Co
Chicago, Ill

247 Snow Manufacturing Co
Bellwood, Ill

910 Snyder Corp
Detroit 7, Mich

1110 The Springfield Machine Tool Co
Springfield, Ohio

1450 The Standard Electrical Tool Co
Cincinnati 4, Ohio

1509 "Steel"
Cleveland, Ohio

1014 Sundstrand Machine Tool Co
Rockford, Ill

1513 Sun Oil
Philadelphia, Pa

1542 Sweets Catalogue Servic.
New York, NY

1426 The Taft-Peirce Manufacturing Co
Woonsocket, R I

850 The Thompson Grinder Co
Springfield, Ohio

842 U S Tool Company, Inc.
Ampere (East Orange), N J

1514 "Tool Engineer"
Detroit, Mich

1529 "Tooling and Production"
Cleveland, Ohio

351 Van Norman Machine Co, Div of Van Norman Industries, Inc
Springfield 7, Mass.

1508 Vickers Inc, Div Sperry Rand
Detroit 30, Mich

1120 Walsh Press & Die Div of American Gage & Machine Co
Chicago, Ill

451 The Warner & Swasey Co
Cleveland 3, Ohio

1249 Wiedemann Machine Co
King of Prussia, Penn

1512 Wilson-Carr Inc
Chicago 5, Ill

1444 K R Wilson, Inc Hydraulic Div
Arcade, N Y

1149 Wysong & Miles Co
Greensboro, N C

Numerical Control Equipment at the Production Engineering Show

No.	Booth	Control Builder	Model	Function	Machine	Input	See page
1	530	Bendix Corp	Dyna-Point 20	Positioning	Moore jig borer	std tape	514
2	530	Bendix Corp	Dyna-Path 20	Contouring	Pratt & Whitney Numeric Keller	std tape	510
3	530	Bendix Corp (distr)	Ferranti FP-22	Positioning	Burgmaster turret drill		529
4	530	Bendix Corp (distr)	Ferranti FI-22	Positioning	coordinate inspection machine		—
5	136	Diehl Manufacturing Co	Singer	Positioning	Fosdick 5BM drillpress	std tape	—
6	136	Diehl Manufacturing Co	Singer	Positioning	Wade lathe	std tape	—
7	103	Farrand Controls	Inductosyn	Positioning	Moore jig borer	std tape	516
8	103	Farrand Controls	Inductosyn	Positioning	rotary table	std tape	516
9	103	Farrand Controls	3-speed Inductosyn	Positioning	lathe bed	std tape	516
10	110	General Electric Co	Mark Century 103-PC	Contouring	Kearney & Trecker milling machine	std tape	509
11	206	Moog Servocontrols, Inc	2-axis pneumatic and hydraulic system	Positioning	Burgmaster turret drill	std tape	—
12	221	Norden Div, United Aircraft Corp	Series 100 Modumatic	Positioning	mock-up demonstration	std tape	513
13	221	Norden Div, United Aircraft Corp	Series 400 and 600	Positioning	automatic inspection system	std tape	530
14	411	Reliance Electric & Engineering Co	2-axis	Positioning	Lahr special drilling	std tape	512
15	509	Wang Laboratories, Inc	Weditrol	Positioning*	Cincinnati Milling milling machine	std tape	—
16	101	Westinghouse Electric Corp	Prodac	Positioning	Moore jig borer	std tape	—
—	334	Friden, Inc			Flexowriter		527
—	334	Friden, Inc			Tape-to-Tape Code Converter		509
—	428	International Business Machines			Model 1620 computer and tape cutter		
—	229	Scully-Jones & Co			automatic tool changing system		510

NOTES: "std tape" means standard 1-inch, 8-channel, punched paper or plastic tape.

*after the word positioning means modified to provide simple profiling.

OVER for Machine Tool Exposition

(pages 191 to 194) August 22, 1960

American Machinist / Metalworking Manufacturing

Numerically Controlled Machines at the Machine Tool Exposition—1960

No.	Booth	Manufacturer	Machine	Control System: Function	Name or Model	Builder	Input	Story in this issue of AM/MM page
1	148	Chas G Allen Co	No. 3 vertical drill, 16x16-in. table	Positioning	3-axis	Reliance	std tape	—
2	381	American Tool Works Co	Radial drill and 30x30 positioning table	Positioning	2-axis, Ultra-Precision	Sperry	std tape	233
3	381	American Tool Works Co	Model 2509, 20-in. engine lathe	Positioning	modified Mark II	General Electric	std tape	210
4	381	American Tool Works Co	Openside drilling and boring machine, 80x180 in.	Positioning	modified Mark II	General Electric	std tape	227
5	543	Atlantic Machine Tool Works, Inc	jig borer	Positioning	2-axis	Norden	std tape	—
6	822	Avey Div, Motch & Merry-weather Machinery Co	Model 250 Turret-Dex 9x18-in. table turret drill	Positioning	2-axis Model 150	Micro-Path	std tape	231
7	452	Brown & Sharpe Mfg Co	No. 2 vertical mill for cam milling	Positioning	Numericam; Mark II	General Electric	std tape	244
8	452	Brown & Sharpe Mfg Co	6-spindle turret drill, 15x20-in. table	Positioning	Mark II	General Electric	std tape	226
9	834	Burg Tool Mfg Co, Inc	2BHT ¾ in. 2 hp 10x18 in. table, 6-spindle turret drill	Positioning	modified Mark II	General Electric	std tape	223
10	834	Burg Tool Mfg Co, Inc	2BHTL ¾ in. 3 hp 15x26 in. table, 6-spindle turret drill	Positioning	Mark III	General Electric	std tape	223
11	834	Burg Tool Mfg Co, Inc	2BHTL ¾ in., 3 hp 15x26-in. table, 6-spindle turret drill	Positioning	3-axis	Hughes	std tape	226
12	834	Burg Tool Mfg Co, Inc	25AHT 1¼ in., 10 hp 15x26-in. table, 6-spindle turret drill	Positioning	modified Mark II	General Electric	std tape	223
13	834	Burg Tool Mfg Co, Inc	3BHT 1½ in., 15 hp 20x30-in. table, 8-spindle turret drill	Positioning	modified Mark II	General Electric	std tape	223
14	834	Burg Tool Mfg Co, Inc	3BHTL 1½ in., 15 hp 30x45-in. table, 8-spindle turret drill	Positioning	modified Mark II	General Electric	std tape	223
15	834	Burg Tool Mfg Co, Inc	3BHTB 1½ in., 15 hp 48x60-in. table, 8-spindle planer type turret drill	Positioning	modified Mark II	General Electric	std tape	223
16	849	Carlton Machine Tool Co	vert drilling, boring 66x96-in. table	Positioning	2-axis	Carlton Controls	std tape or key	229
17	849	Carlton Machine Tool Co	horiz drilling, boring 72x96-in. table	Positioning	2-axis	Carlton Controls	std tape or key	224
18	934	Cincinnati Lathe and Tool Co	22-in. 15-hp Cintimatic engine lathe	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	197
19	934	Cincinnati Lathe and Tool Co	24-in. medium duty vertical drill, 10x20 in. table	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	229
20	934	Cincinnati Lathe and Tool Co	25-in. heavy duty vertical drill, 10x20-in. table	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	229
21	934	Cincinnati Lathe and Tool Co	6-spindle turret drill, 10x20-in. table	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	222
22	1034	Cincinnati Milling Machine Co	16-in. vertical Hydro-Tel	Contouring	3-axis Acramatic	Cincinnati Milling	std tape	244
23	1034	Cincinnati Milling Machine Co	Bridge-type, traveling table milling machine	Contouring	3-axis Acramatic	Cincinnati Milling	std tape	—
24	1034	Cincinnati Milling Machine Co	Grinding machine	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	—
25	431	DeVlieg Machine Co	Model 3H-72 Jigmil	Positioning	Tapac III	DeVlieg	std tape	241
26	531	Edlund Machinery Co	layout drilling machine	Positioning	Mark II	General Electric	std tape	227
27	846	Ekstrom, Carlson & Co	milling and profiling machine	Contouring	Mark III	General Electric	std tape	243

Guide to Numerical Control at the 1960 C

25	431	DeVlieg Machine Co	Model 3H-72 Jigmil	Positioning	Tapac III	DeVlieg	std tape	241
26	531	Edlund Machinery Co	layout drilling machine	Positioning	Mark II	General Electric	std tape	227
27	846	Ekstrom, Carlson & Co	milling and profiling machine	Contouring	Mark III	General Electric	std tape	243
28	946	Ex-Cell-O Corp	Model 922 Numera-Trol grinding, turning, boring	Contouring	2-axis	Bendix	punched tape	212
29	331	Famco Machine Co	No. 200 vertical milling machine	Positioning	3-axis	Minneapolis-Honeywell	std tape	244
30	800	Fosdick Machine Tool Co	54P jig borer with tool changer	Positioning	2-axis Fosmatic	Fosdick	std tape	—
31	800	Fosdick Machine Tool Co	44PG jig grinder	Positioning	2-axis Fosmatic	Fosdick	dial	—
32	800	Fosdick Machine Tool Co	32-spindle turret drill	Positioning	modified Mark II	General Electric	std tape	—
33	800	Fosdick Machine Tool Co	single-spindle layout	Positioning	Mark II	General Electric	std tape	—
34	1320	Giddings & Lewis Machine Tool Co	38x52-in. table and drill	Positioning	Numeripoint	Giddings & Lewis	std tape or dial	228
35	1320	Giddings & Lewis Machine Tool Co	42-in. vertical turret lathe	Positioning	Numeripoint	Giddings & Lewis	std tape	203
36	1320	Giddings & Lewis Machine Tool Co	5-in. horizontal boring, drilling, milling	Positioning	Numeripoint	Giddings & Lewis	std tape or dial	215
37	1320	Giddings & Lewis Machine Tool Co	5-in. floor type horiz boring, drilling, milling	Positioning	Numeripoint	Giddings & Lewis	std tape or dial	215
38	1320	Giddings & Lewis Machine Tool Co	No. 3 jig borer	Positioning	Numeripoint	Giddings & Lewis	std tape or dial	214
39	1320	Giddings & Lewis Machine Tool Co	DiMil horizontal die sinking	Contouring	Numeripath	G&L-GE	14-channel magnetic	240
40	1042	Gisholt Machine Co	turret lathe	Positioning	Prodac	Westinghouse	std tape	206
41	1042	Gisholt Machine Co	turret lathe	Contouring	Factrol 101	Gisholt	wide magnetic tape	204
42	1350	G A Gray Co	horizontal boring, drilling, milling	Positioning	2-axis Series 600	Norden	std tape	—
43	924	Heald Machine Co	20x48-in. table, vertical drill	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	222
44	924	Heald Machine Co	Model S boring machine	Positioning	2-axis Acramatic	Cincinnati Milling	std tape	—
45	839	Jones & Lamson Machine Co	turret lathe	Positioning	2-axis	Jones & Lamson	std tape	207
46	839	Jones & Lamson Machine Co	20x20 table	Positioning	2-axis	Jones & Lamson	std tape	227
47	1008	Kearney & Trecker Corp	8-position index Mod II Milwaukee-Matic	Positioning*	modified Mark III	General Electric	std tape	239
48	1008	Kearney & Trecker Corp	rotary table, Mod II Milwaukee-Matic	Positioning*	modified Mark III	General Electric	std tape	239
49	1008	Kearney & Trecker Corp	Model 205-CH vertical mill	Contouring	Mark Century	General Electric	std tape	—
50	824	W B Knight Machinery Co	Model 65 jig borer	Positioning		Sperry	std tape	218
51	1229	Lapointe Machine Tool Co	48-in. rotary table double column drilling, boring machine	Positioning	2-axis	Norden	std tape	223
52	810	R K LeBlond Machine Tool Co	Model 2013 Tape-Turn lathe	Contouring	Mark Century	General Electric	std tape	—
53	631	Leland-Gifford Co	single-spindle hole locator, 10x15-in. table	Positioning	Mark II	General Electric	std tape	—
54	631	Leland-Gifford Co	2-spindle hydraulic 10x15-in. fast table hole locator	Positioning	modified Mark II	General Electric	std tape	—
55	838	Lucas Machine Div, New Britain Machine Co	table type boring, drilling, milling	Positioning	Numra-Tronic	General Electric	std tape	—
56	838	Lucas Machine Div, New Britain Machine Co	floor type boring, drilling, milling	Positioning	Key-Tronic	General Electric	dial	—
57	701	Monarch Machine Tool Co	Series 80 heavy duty lathe	Contouring	Pathfinder	Thompson-Ramo-Wooldridge	std tape	—
58	1205	National Automatic Tool Co, Inc	drilling, tapping, milling machine	Positioning	3-axis	Natco	std tape	234
59	338	Portage Machine Co	horizontal boring, drilling, milling	Positioning	Tele-Probomat	Warner & Swasey	std tape	—
60	231	Seneca Falls Machine Co	Model LQ automatic tracer lathe	Positioning	1-axis digital	Seneca Falls	dial	204
61	231	Seneca Falls Machine Co	Model LQ automatic tracer lathe	Positioning	2-axis digital	Seneca Falls	dial	204
62	341	Sibley Machine & Foundry Co	single-spindle upright 14x18-in. table	Positioning	2-axis Model 3A	Micro-Path	steel tape	—
63	1014	Sundstrand Corp	Model 21 vertical 20-unit tool changer rail-type machine	Positioning*	modified Mark III	General Electric	std tape	240
64	850	Thompson Grinder Co	Type C Tapeforming grinder	Contouring	3-axis Director System	Thompson-Ramo-Wooldridge	std tape	—
65	451	Warner & Swasey Co	1AC single-spindle automatic chucking machine	Positioning	2-axis	Warner & Swasey	std tape	207
66	451	Warner & Swasey Co	SCA-25 25-in. turret lathe	Contouring	4-axis Servofeed	Warner & Swasey	std tape plus buttons	201
67	451	Warner & Swasey Co	4A saddle-type turret lathe	Contouring	2-axis Servo-Tape	Warner & Swasey	tad tape	208
68	1249	Wiedemann Machine Co	Model A15, 15-ton, 30x48-in. turret punch	Positioning	modified Mark II	General Electric	std tape	282D
69	1249	Wiedemann Machine Co	Model A15, 15-ton 30x48-in. turret punch	Positioning		Sperry	std tape	282D

NOTES: "std tape" means standard 1-inch, 8-channel, punched paper or plastic tape. * after the word positioning means modified to provide simple profiling.

OVER for Production Engineering Show

Chicago Shows

For a listing of last-minute additions, check at Booth 1548, International Amphitheatre (between registration area and Conrad Hilton Restaurant) or at Booth 131, Navy Pier. The editors of AM/MM will post such additions as soon as possible after the shows open.

40 questions you can ask . . . In evaluating numerical-control systems

These questions are provided as a guide only. They are not, by any means, intended to convey the impression that an adequate system must include all of the items described. A numerical-control system should be selected on the basis of its ability to perform the functions you require of it, and be paid for accordingly. Answers to these questions will help you evaluate the many systems being offered.

1. What is the absolute accuracy of the combined control system and machine with regard to end-product accuracy?

2. What is the repeatability of the machine and control combination? How does repeatability vary with work weight?

3. What system is used for basic measurement?

4. How accurate is the measuring system?

5. What determines the degree of accuracy, or limits it,—leadscrew, rack, transducer, optics, etc?

6. Does the system have "zero offset?" Over what range? What method is used to shift the zero point (differential synchros, tape, clutch, potentiometers, etc)?

7. What is the type and size of drive? Can more than one type of drive be controlled?

8. What is the maximum positioning speed and the actual time required to position all axes a distance of 10 inches or 30 degrees? How does degree of accuracy affect positioning speed?

9. What type of tape is used, if any? How wide is tape and what coding method is used? (1-in.-wide, 8-channel tape is standard)

10. Is block length of tape reader fixed or variable? What type of tape reader is used—block or sequential?

11. Does the decoder provide a parity check—(a simple check on the accuracy of tape preparation)? How is the parity error shown?

12. Does the control system have manual input? What method of manual input is used—telephone dial, selector switches, potentiometers, etc?

13. Can positive and negative numbers be programmed; can machine position in all four quadrants (+X, —X, +Y, and —Y)? What is the smallest motion that can be programmed? How many digits can be programmed before the decimal point; how many digits can be programmed after the decimal point?

14. Can all axes be positioned simultaneously? Is final positioning always in the same direction?

15. What types of relays, if any, are used in the decoder, the storage (or memory) circuitry, and any auxiliary logic?

16. How many auxiliary functions are available? What are these functions? Are a tool-change indicator light and reset button included in the system?

17. Are interlocks, and warning devices, included in the system to prevent damage to machine, part, and/or tools? What happens when a collision or excess motion is accidentally programmed?

18. Are operation number and position read out in visible form? What size and type of indicator is used?

19. Does the control system automatically actuate table clamping? What type of clamp or method of clamping is used? If "no," how is position held during machining?

20. If the control system fails, can the machine be operated as a conventional, or manual, machine? What must be done to permit manual operation?

21. Is the control system "open loop" or "closed loop?" (Closed-loop systems include feedback to indicate actual position to director, then compare actual to desired position and compensate for errors.) If feedback is not included, what guarantees that desired position is achieved? Under what conditions can a closed-loop system go open-loop—and what checks its accuracy when this happens? (What is the effect of a momentary power failure, for example?)

22. Is the system basically electrical, electronic, hydraulic, pneumatic, optical, mechanical, etc? What combination of these functions are used, and where in the system?

23. If the light indicating "In Position" fails to go on after the positioning cycle has stopped, how is the machine repositioned to try again? Can the failure of a component cause the machine to position incorrectly with the "In Position" indicator on.

24. Can automatic tool changing—or work loading and unloading—be directed by the control system? How is this accomplished?

25. Are block diagrams of the system available for specific applications?

26. How many motions, or axes, are controlled? Is the system primarily for positioning or for continuous-path control? (Does the basic positioning system include any internal programming for control of simple angles and radii?)

27. Do electrical and electronic schematics have typical voltages and waveforms shown on them? What are the power requirements of the system?

28. What type of electronics is used—vacuum tubes, transistors, magnetics, relays, static switches, etc?

29. Is the construction modular and plug-in? What type of quick-disconnects are used? Are test points available and marked conspicuously on control assembly?

30. Are neon indicators provided on relay coils to show improper function?

31. Are *X* and *Y* axes plug-in units readily interchangeable in the control assembly?

32. How closely must voltage be regulated? Is the control system sensitive to line transients?

33. What is the ambient temperature range in which controls will perform satisfactorily?

34. Are there any checking features in the control that will check the control's operation and positioning accuracy?

35. What spare parts does the control manufacturer recommend?

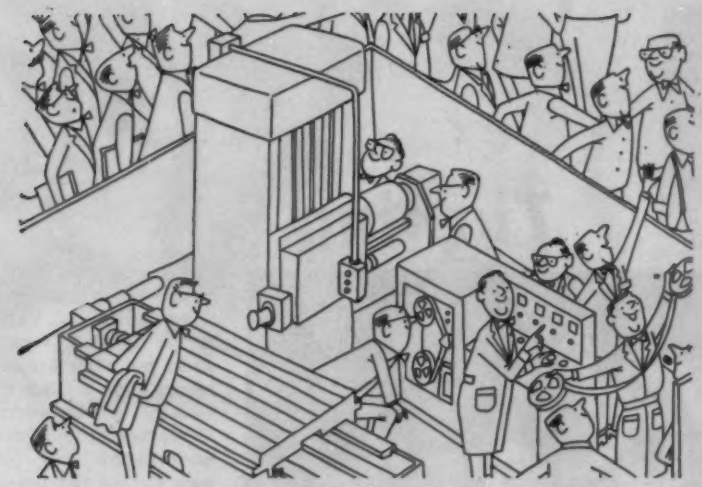
36. What production history is available for the control system? Where can you see a system in operation?

37. Who will train your employees in the use of the system?

38. Who will provide service and maintenance on the complete machine-and-control system? On what time and cost basis are these services offered?

39. Is any special cutting-tool preparation required?

40. What is the *complete* cost of the installed system—or, even better, the complete cost of the machine-and-control system, including programming and tape preparation equipment?



Machine Tool Exposition in Print

The exciting details on nearly all of the brand new machine tools to be in operation at the Machine Tool Exposition are on the next hundred pages. Only a few machines were not ready in time to include here, and will be covered in later issues. To refresh your memory on recent important developments, the editors have provided brief descriptions of new machines described in AM/MM since last October 1, with reference to issue and page of the original article.

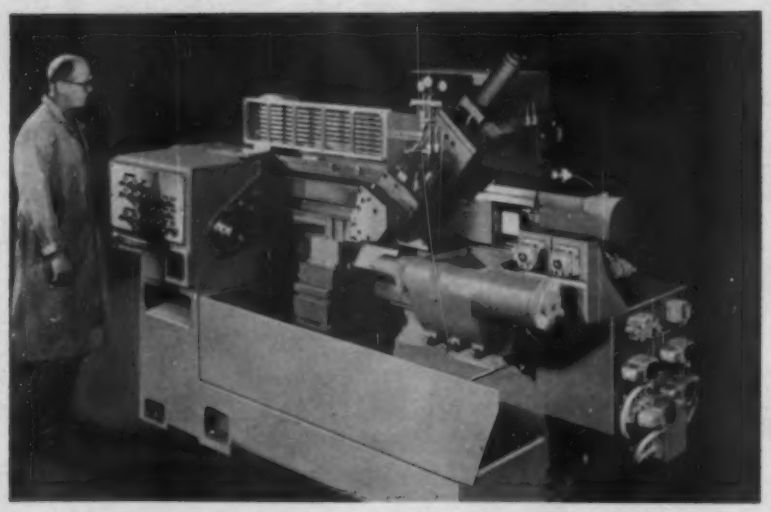
To assist you further in locating what you want to see, each classified section includes a list of exhibitors showing that type of equipment. Be sure to check each of them when you are at the Exposition.

Classified Index of Equipment

196 Turning
214 Boring
220 Planing and Shaping
222 Drilling
234 Tapping and Threading
239 Milling
247 Special Machines
248 Gear Cutting and Finishing
252 Grinding, Honing, Lapping
274 Cutoff and Filing
275 Bending and Shearing
278 Forming, Forging, Punching
282H Tools and Accessories
286 Inspection

MMT-PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

Turning



Tracing Lathe Takes up to Four Cuts in Single Automatic Cycle from One Templet

One outstanding feature of the Sundstrand 1425-T multi-cycle tracer lathe is that it can take three roughing or semi-finishing cuts and one finishing cut in a single automatic cycle from one templet. The roughing and finishing tools are mounted on a two-positioning indexing tool block. The roughing tool will take up to three cuts automatically. Then the finishing tool indexes into position for the finishing cut.

The tracer carriage is driven longitudinally at adjustable feed rates from 4 to 50 ipm. Rapid traverse rate is 180 ipm. A separate facing-tool slide can feed across at any preselected time during the cycle, but is usually set to operate during the semifinishing cut so as not to exert unnecessary tool pressure on the part during the finishing cut. Cross-feed rates are infinitely adjustable from 1 to 180 ipm.

Control panel, automatic-cycle-control dogs, and tool adjustments are within easy reach of the operator. Easily adjusted micrometer screws control depth of cuts. Ample space is provided for loading and chip removal.

Step turning can be done from preset dogs, without templets. Simple insert templets can be used for turning tapers or general contours.

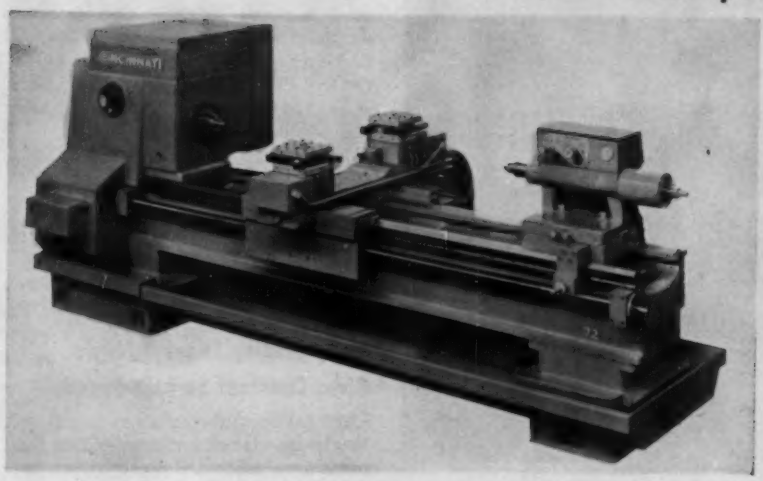
Lathe has a 25-hp, two-speed head. The second speed may be engaged automatically at any time in the machining cycle. A 40-hp model and four-speed heads are also available.

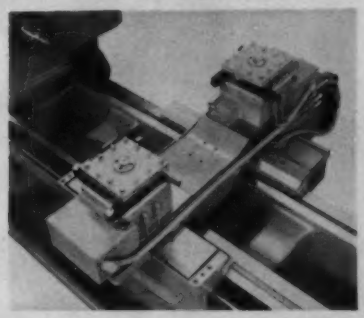
Sundstrand Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 51, inside back cover

EXHIBITORS SHOWING TURNING EQUIPMENT

BOOTH	EXHIBITOR
381	American Tool Works Co Cincinnati 29, Ohio
1142	The Baird Machine Co Stratford, Conn
923	Barber-Colman Co Rockford, Ill
741	Bardons & Oliver, Inc Cleveland 13, Ohio
452	Brown & Sharpe Mfg Co Providence, R I
1440	Sidney Machine Tool Co, Inc Sidney, Ohio
934	Cincinnati Lathe & Tool Co Cincinnati 9, Ohio
900	The Cleveland Automatic Machine Co Norwood, Cincinnati 12, Ohio
1215	Cone Automatic Machine Company, Inc Windsor, Vermont
146	Davis & Thompson Co Milwaukee 18, Wisconsin
1220	Frauenthal Div, The Kaydon Engineering Corp Muskegon, Michigan
1320	Giddings & Lewis Machine Tool Company Fond du Lac, Wisconsin
1042	Gisholt Machine Company Madison 10, Wisconsin
839	Jones & Lamson Machine Company Springfield, Vt
810, 908	The R K LeBlond Machine Tool Co Cincinnati 8, Ohio
1046	The Lodge & Shipley Co Cincinnati 25, Ohio
701	The Monarch Machine Tool Co. Sidney, Ohio
822	The Motch & Merryweather Machinery Co Cleveland 17, Ohio
781	The National Acme Co Cleveland 8, Ohio
1319	Nebel Machine Tool Corp Cincinnati 25, Ohio
1210	Rivett Lathe & Grinder, Inc Brighton, Boston 35, Mass
1001	Rockford Machine Tool Co Rockford, Ill
231	Seneca Falls Machine Co Seneca Falls, N Y
1014	Sundstrand Machine Tool Co Rockford, Ill
451	The Warner & Swasey Co Cleveland 3, Ohio





Cintimatic Numerically Controlled Lathe Features Fast Setup, Short-Run Speed

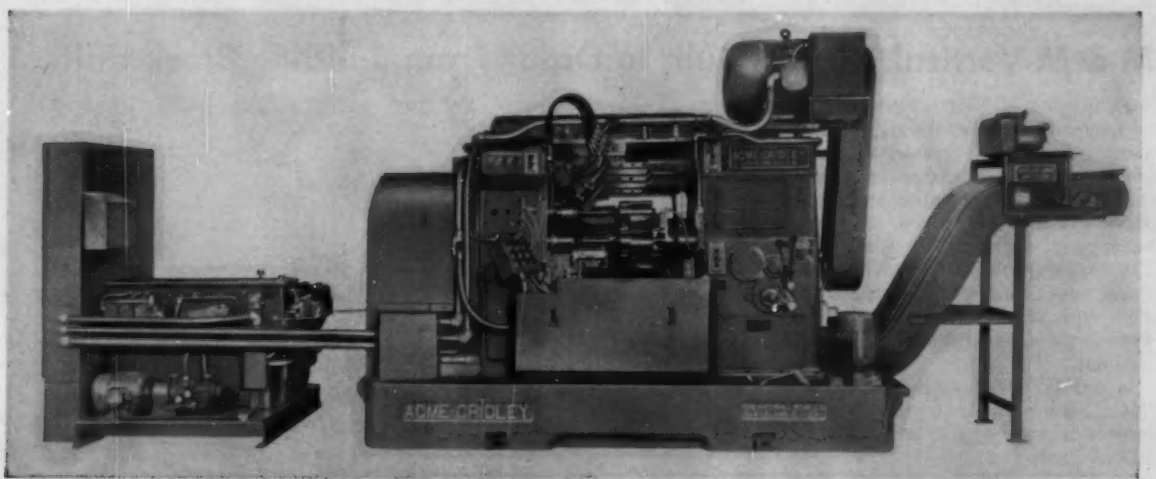
Standard EIA 8-channel tape operates this production lathe—only loading and unloading the work between centers is required from the operator. Two four-tool turrets, one front, one rear, are completely under numerical control. These tools are preset in their holders so no tool adjustment is required when the machine is shifted from one job to another.

A Cincinnati Acramatic system controls tool position, feed rate, spindle speed, coolant, and cycle. Fine adjustments can be made by "zero shift," minute handwheel adjustment of programmed cross and longitudinal axes without effect on the control tape.

The geared-head lathe has a three-bearing spindle mount, high rigidity, and backlash eliminators. It has 15 hp, 22¼-in. swing over bed, 12 in. over slide, and 42, 72, or 96 in. between centers. Eight spindle speeds range from 50 to 2000 rpm; both axes have 99 feed rates.

Cincinnati Lathe & Tool Co, Cincinnati 9, Ohio—Booth 934

MORE DATA? Circle 52, inside back cover



Acme-Gridley 6-Spindle Universal Replaces 4 Single Units

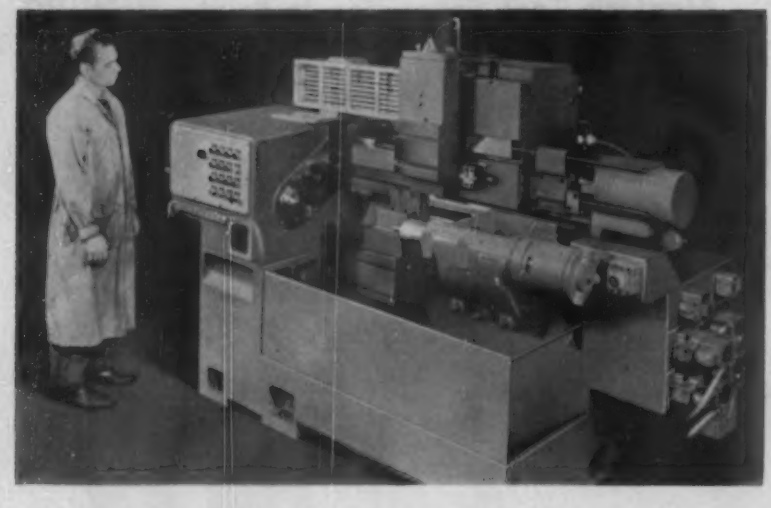
This new six-spindle universal shaft machine provides all the advantages of precision high-speed production of a multiple spindle machine to the machining of relatively long flanged shafts. However, from first case histories, it has been found that, in many instances, these machines can replace four automatic single-spindle units.

This universal machines straight or flanged shafts between centers. Its spindles can be equipped with various holding and driver devices—such as chucks, collets, or work drivers—to suit the nature of the workpieces. Because it has independently cam-operated lower slides for turning, hydraulic tracing, forming, and combinations of these, the machine has even greater versatility. Work feeders can be attached.

Other features are: top slide drive shaft that provides cam drums which allow independent operation of cross slides; turning or tracing slides in the fifth and sixth positions; intermediate cross slide (optional) for forming, grooving, and facing in the fourth position.

National Acme Co, 170 E 131 St, Cleveland 8, Ohio—Booth 781

MORE DATA? Circle 53, inside back cover



Sundstrand Automatic Multi-Tool Lathe Has Vertically Mounted Turning Carriage

Model 1425-M automatic multi-tool lathe combines advanced design and rigid construction. The turning carriage is mounted vertically on hardened and ground ways and has infinitely adjustable feed rates from 4 to 50 ipm. Turning carriage can be set up for angular feed-in, straight feed-in, skip feed, square cycles, and a variety of special cycles without mechanical changes to the machine. It also provides automatic tool relief.

The facing slide can be actuated at any preselected time in the cycle. Its feed rate is infinitely adjustable from 1 to 180 ipm. The open front and side of the machine make for easy manual loading and provide ample room for automatic loaders and chip conveyors. Automatic cycle-control dogs are easily adjusted on a graduated control board located near the pushbutton control panel.

Machine to be demonstrated has a 25-hp, single-speed head with a speed range of 340—2375 rpm.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 54, inside back cover

Acme-Gridley Chuck-T-Matic Gives Constant Surface Speeds

Ideal for second operation work, this single-spindle chucking machine features a variable DC motor drive and automatic controls which vary the spindle rpm to give constant surface cutting speed to tracer tools. This provides uniform finish on various diameters and prolongs tool life.

All hydraulic controls are compact and accessible, and handling time is minimized by employing dual tracer attachments to perform two operations in any selected sequence.

National Acme Co, 170 E 131 St, Cleveland 8, Ohio—Booth 781

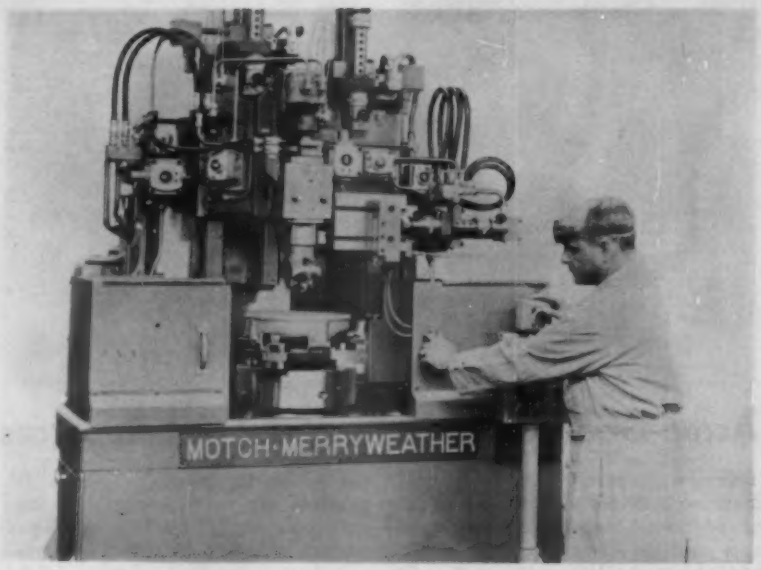
MORE DATA? Circle 55, inside back cover

M & M Vertical Turners Built to Order From Building Block Units

Each Vertical Turner is custom-built to perform specific boring, facing, turning, but can be changed easily to match the requirements of model changes and new turning problems. Rigid, internally ribbed cast-iron bases and columns are assembled like building blocks to make a machine which has one or more spindles, with many hydraulically controlled tools on slides mounted on columns.

Model 1-V is shown here machining a motor end-bell. Several different diameters are rough bored and turned, then finish bored and turned. The old method required two separate chuckings on conventional equipment and took a total of 11.6 minutes. The 1-V completes the entire operation in 46 seconds.

Micrometer adjustments of the positive stops in the hydraulic slide movement provide a high degree of accuracy.



Specifications on the 1-V include a maximum part swing of 18 in.; turning-slide stroke, 8 in.; cross-slide stroke, 4 in.; spindle drive motors up to 20 hp. Model 2-V, also on display swings 20 in., has a turning slide stroke of 14 in., and a cross-slide stroke of 6 in. Standard spindle drive motor on the 2-V is 20 hp, but up to 30 hp is available.

Lowest priced Vertical Turner is approximately $13,000; the highest priced unit now in construction runs about $120,000.

Motch & Merryweather Machinery Co, 1250 E 222 St, Cleveland 17, Ohio—Booth 822

MORE DATA? Circle 56, inside back cover

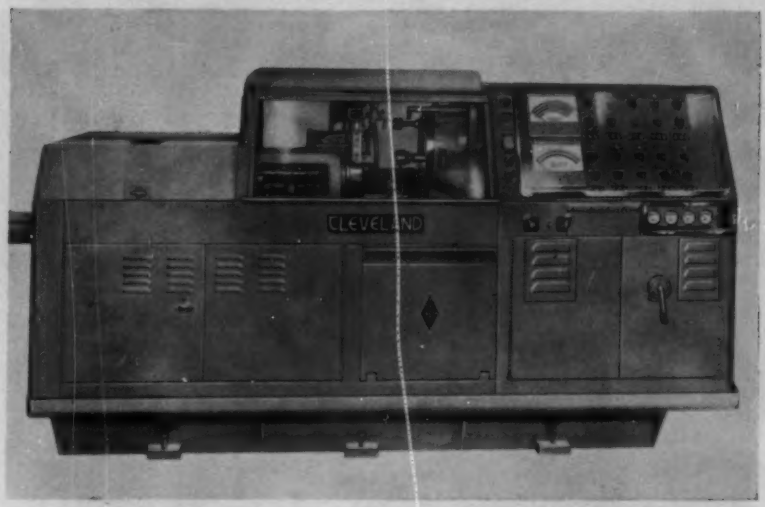
Cleveland 1⅝-in. Bar Automatic Monitors Speed and Feed

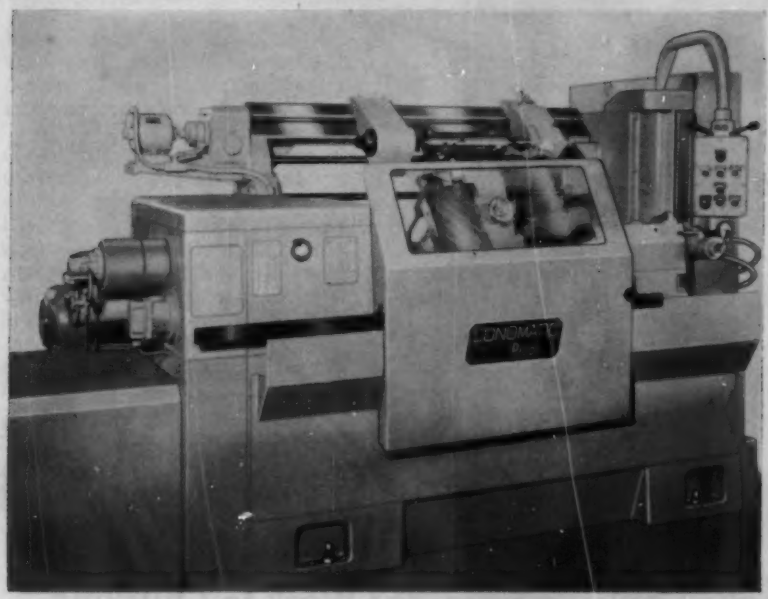
This single-spindle bar automatic has ten infinitely variable spindle speeds for each cycle of the machine. These speeds range from 40—3100 rpm. The ten turret feeds, like the spindle speeds, are infinitely variable and are all controlled from switches on the control panel.

One of the newest features of this 1⅝-in. Model AB Dialmatic is the monitor arrangement. A spindle speed and a feed monitor accurately indicate the spindle speed, in rpm, and the feed, in ipm, for each of the turret positions.

The Cleveland Automatic Machine Co, 4932 Beech St, Cincinnati 12, Ohio—Booth 900

MORE DATA? Circle 57, inside back cover





Cone Multi-Cycle Copier Follows French Basic Design

Conomatic Pilot KU-10 is one of several models of multi-cycling automatic copying lathes built and marketed under rights granted by H Ernault-Batignolles of France. This lathe can completely copyturn a part, including straight shoulders on either side. Also two independent slides, which operate in either direction, are applicable for front and rear tooling.

Cone Automatic Machine Co, Inc, Windsor, Vt—Booth 1215

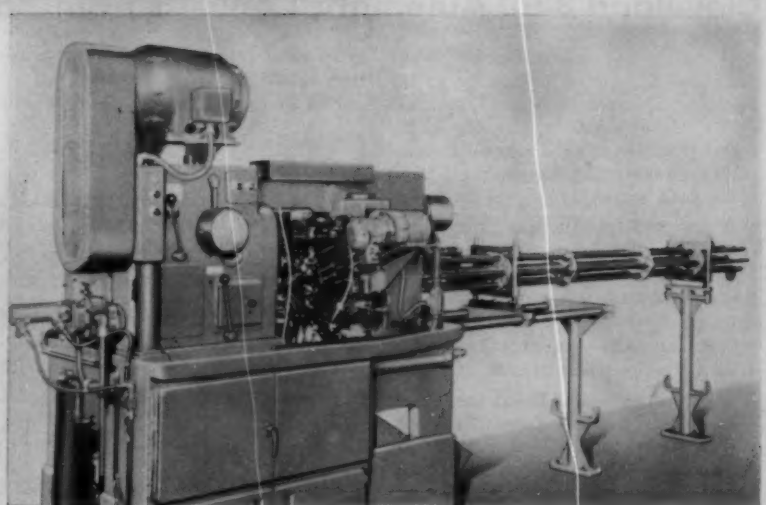
MORE DATA? Circle 58, inside back cover

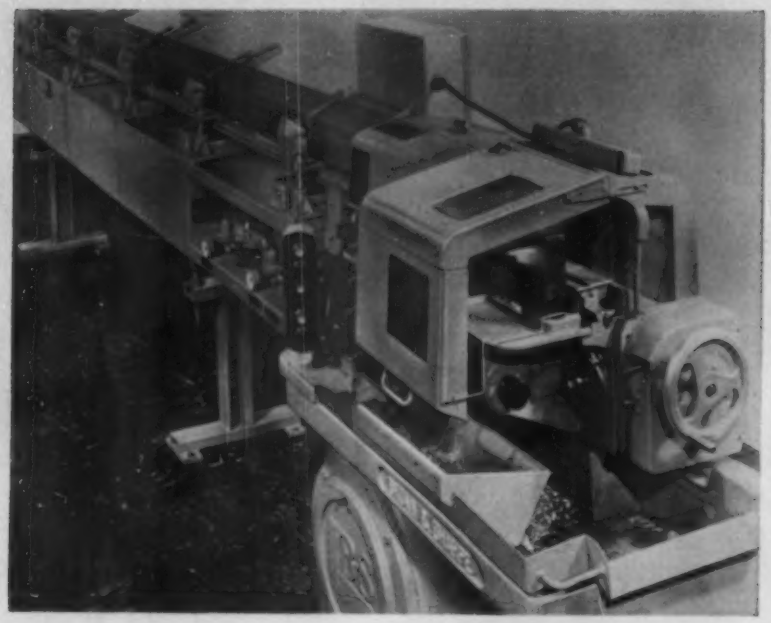
Cone "QF" Six-Spindle Handles Cross Operations

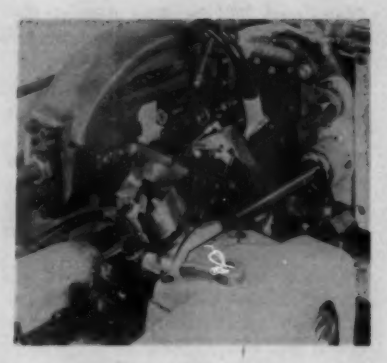
Model "QF" Bar Conomatic, a 6-spindle machine, has a stop-spindle mechanism which permits use of auxiliary attachments for cross drilling, cross milling, and other operations that would otherwise require second handling. Recommended maximum work spindle speed is 3500 rpm; idle time is 0.458 sec.

Cone Automatic Machine Co, Inc, Windsor Vt—Booth 1215

MORE DATA? Circle 59, inside back cover







Browne & Sharpe No. 00 Screw Machine Runs at 10,000 RPM with No Stock Whip

Stock whip has been successfully overcome in Brown & Sharpe's No. 00 automatic screw machine; therefore, it can run with a 10,000 rpm spindle speed. The machine is a nonreversing type and is fitted with a turret.

Stock feed occurs while the spindle is traveling at 10,000 rpm. But the stock itself cannot rotate at such speed during feeding, or it will whip and cling to the wall of the spindle because of centrifugal force and can't be fed through the collet. Therefore control is achieved by slowing down the bar to say 250—300 rpm momentarily.

Engineers from Lipe Rollway (which supplies the feed—a Model 56 AML bar feed, shown above) worked in conjunction with Brown & Sharpe engineers to solve the problem. A floating spindle liner is installed in the AML bar feed. Above the liner there is a friction brake that is operated by a pancake-type air cylinder. The floating spindle liner revolves on a special set of long-life nylon bearings, and the brake is applied when the collet opens. A cam trips the air control.

The action must be effective and rapid, because feed can occur once per sec (production rate on typical part is 3600 pieces per hr) on some short-cycle jobs.

A second feature of the 10,000 rpm machine is provision for air ejection of bar ends. When the bar runs out, according to timing and counting mechanisms, the spindle is stopped by one Dynabrake motor, the collet opens, an air cylinder ejects the bar end, and the Lipe feed supplies a fresh bar to the spindle.

For maximum cooling effect when a form tool is used, oil is fed from the rear of the turret.

Brown & Sharpe Mfg Co, Providence, RI—Booth 452

MORE DATA? Circle 60, inside back cover

Cleveland 3-in. Automatic Converts from Bar Work to Chucking

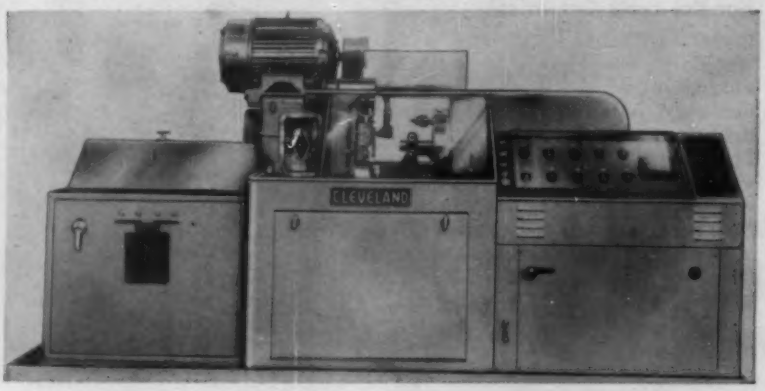
Although this single-spindle Dialmatic was designed primarily to be used as a bar machine, it can be easily converted to a chucker in 30 min by substituting a simple chucking attachment for the standard bar-stock feed assembly.

It has 112 spindle speeds ranging from 24—1820 rpm; all ten turret feeds are dial controlled and infiintely variable. A new feature on the machine is the feed monitor which indicaets the exact feed for each turret position in ipm.

This 3-in. Model AB—at the Show—will rough bore two diameters, rough turn two diameters, finish bore, finish turn, cut threads, and profile a seat. The production time is 76 sec per piece—a gross production of 47 pieces an hr.

The Cleveland Automatic Machine Co, 4932 Beech St, Cincinnati 12, Ohio—Booth 900

MORE DATA? Circle 61, inside back cover



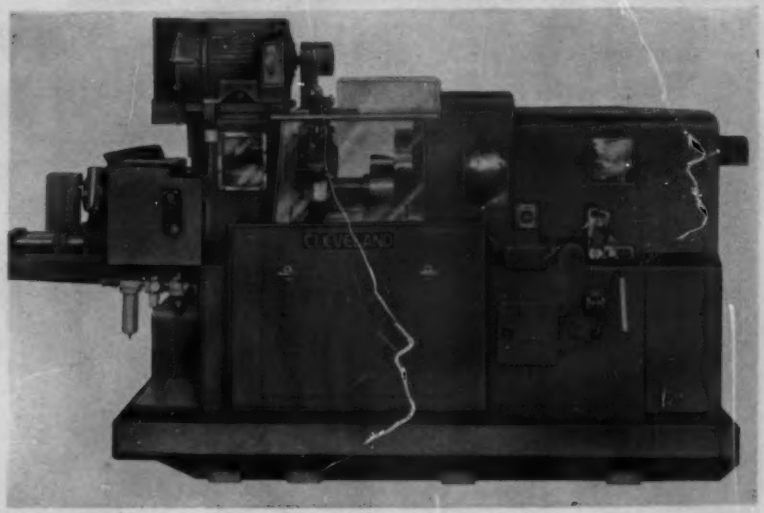
Cleveland AW Single-Spindle Has New Type Feed Bracket

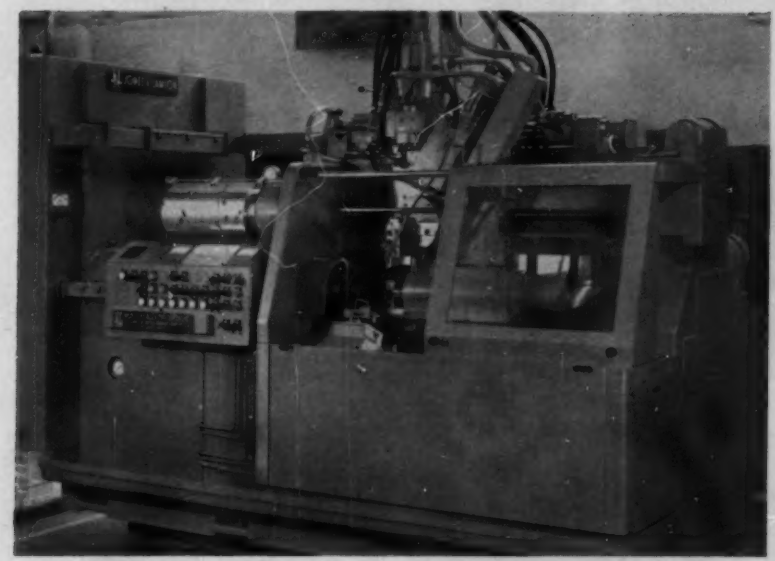
This 2½-in. Model AW was designed for users who prefer an economical automatic equipped with mechanical speed and feed drives. It has 40 spindle speeds ranging from 69—1920 rpm.

The two new features of this machine are a completely new type of feed bracket including automatic air-operated clutches, and complete guarding which not only makes the machine safer but also gives it a new modern appearance.

Cleveland Automatic Machine Co, 4932 Beech St, Cincinnati 12, Ohio —Booth 900

MORE DATA? Circle 62, inside back cover



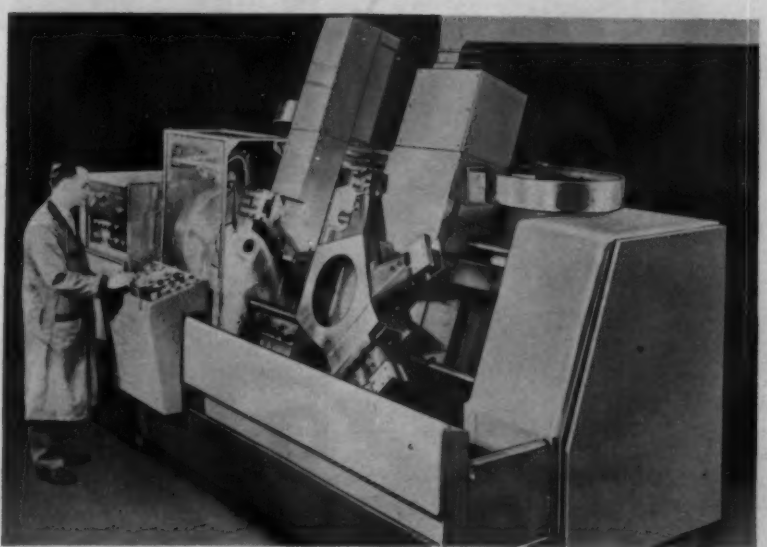


J&L Model 30 Tracer Has Choice of Slide Angle

Automatic Tracing Lathe, Model 30, is shown here with a 60° tracing slide. It is also available with a 180° (two-dimensional) tracing slide. Multiple tooling may be applied to a rear forming slide, or a rear facing, forming and turning slide. Two different headstock transmissions (16 or 32 speeds) as well as two different spindle noses are available. Machine comes in three standard bed lengths, 24, 48, or 72 in. Improvements over the earlier Model 30s include a larger (10-in.-dia) control drum, and additional feeds and speeds.

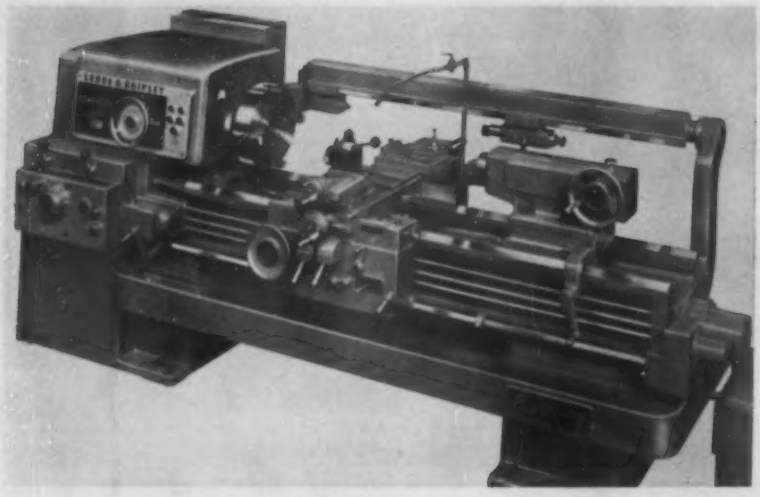
Jones & Lamson Machine Co, Springfield, Vt—Booth 839

MORE DATA? Circle 63, inside back cover



NEW 25-IN. SWING NUMERICALLY-CONTROLLED Servofeed turret lathe features an electronic memory system which can store and recall operational commands of any machining setup. Requiring no tape or other outside programming, machine can insert into its memory such factors as feed, speed, start-of-cut, length, and dimension of the work (AM/MM—June 27 '60, p147) —*Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio*—Booth 451

MORE DATA? Circle 64, inside back cover



Lodge & Shipley Lathes Feature 45°, 90° Tracers

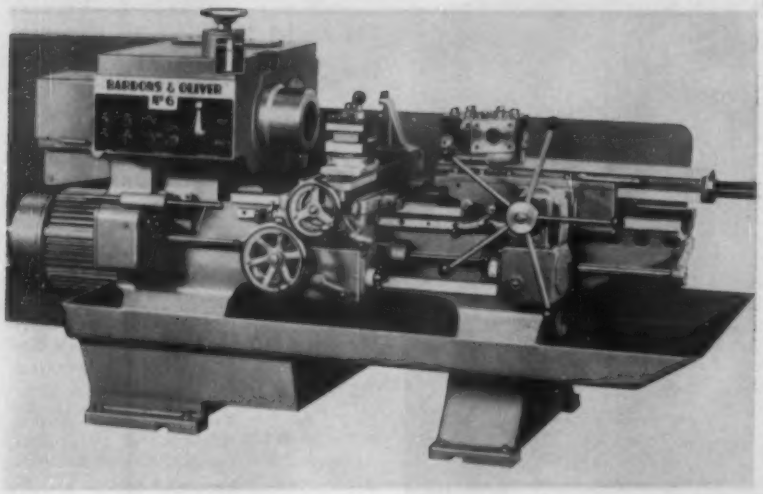
Three Model 2013 Powerturn lathes are being shown by Lodge & Shipley. The 16-in. 90° Copymatic with preselect headstock (illustrated) has a new modulated feed tracer which simultaneously controls both longitudinal and cross feeds. This gives a constant feed rate over the entire contour.

The 16-in. 45° Coypmatic with 4-way rapid traverse (*AM/MM*—May 16 '60, p139) has a new compact carriage-mounted hydraulic tank. This lathe will be demonstrated turning a turbine shaft with a steep contour and will have tracer slide movement arranged for combined speed (simultaneous engagement of longitudinal and cross feed).

Another 16-in. 45° Copymatic will demonstrate the L&S new automatic machining cycle and 4-way power rapid traverse.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio—Booth 1046

MORE DATA? Circle 65, inside back cover



Bardons & Oliver Turret Lathe Delivers Constant HP

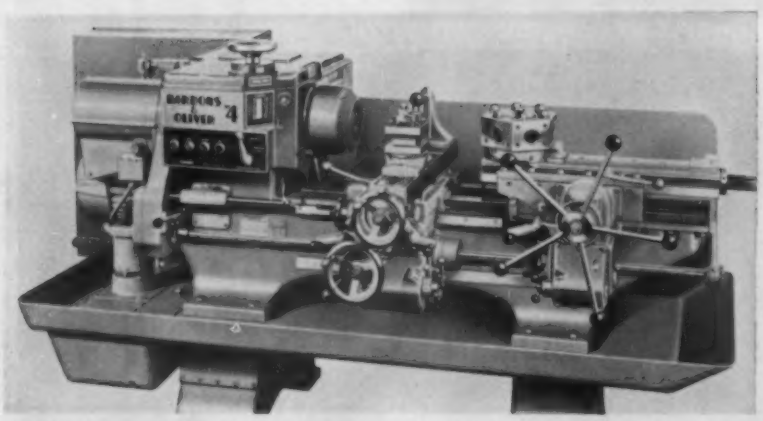
A new ram type turret lathe, with a 3-in. spindle capacity for heavy duty bar work and a 5-in. capacity for light duty bar work, has a 21⅛-in. swing over the bed ways. The headstock, which has sixteen geared spindle speeds, will deliver constant (optional up to 30) at all speeds with a 50 to 1 speed range. Spindle speeds can be preselected and changed automatically.

Twelve fast feed changes are provided for the cross slide, carriage, and hexagon turret which is located on a 5-in. dia tapered roller bearing and held firmly to the slide by a positive lock clamp ring. Cantilever saddle construction provides longer bearing for slide in the saddle and reduces slide overhang from saddle.

Hydraulic collet chuck and bar feed, attachments, and a complete line of tooling are available.

Bardons & Oliver, Inc, Cleveland 13, Ohio—Booth 741

MORE DATA? Circle 67, inside back cover



BARDONS & OLIVER NO. 4 UNIVERSAL RAM-TYPE TURRET LATHE is now equipped with an automatic spindle-speed change mechanism that provides faster and more positive shifting. New hardened and ground splined apron gear shafts increase the metal removing capacity of tool carrying units—*Bardons & Oliver, Inc, Cleveland 13, Ohio*—Booth 741

MORE DATA? Circle 66, inside back cover

UNIVERSAL TURRET LATHE MODEL in new line of No. 2 Micro-Cut ultra-precision lathes features a full universal cross slide and square turret. Machine combines ruggedness and universal characteristics of a turret lathe with accuracy of a precision instrument lathe (AM/MM—June 27 '60, p146)—*Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio*—Booth 451

MORE DATA? Circle 68, inside back cover

MINIATURIZED SINGLE SPINDLE chucking automatic, the 0-AC, brings advantages of automatic production to small lot producers of precision components. 0-AC has a nominal working range of about a 3-in. dia by 3-in. long workpiece. Selection of spindle speed, feed, and slides is automatic (AM/MM—June 27 '60, p146)—*Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio*—Booth 451

MORE DATA? Circle 69, inside back cover

Giddings & Lewis VTL Controlled by "Numeripoint" Tape

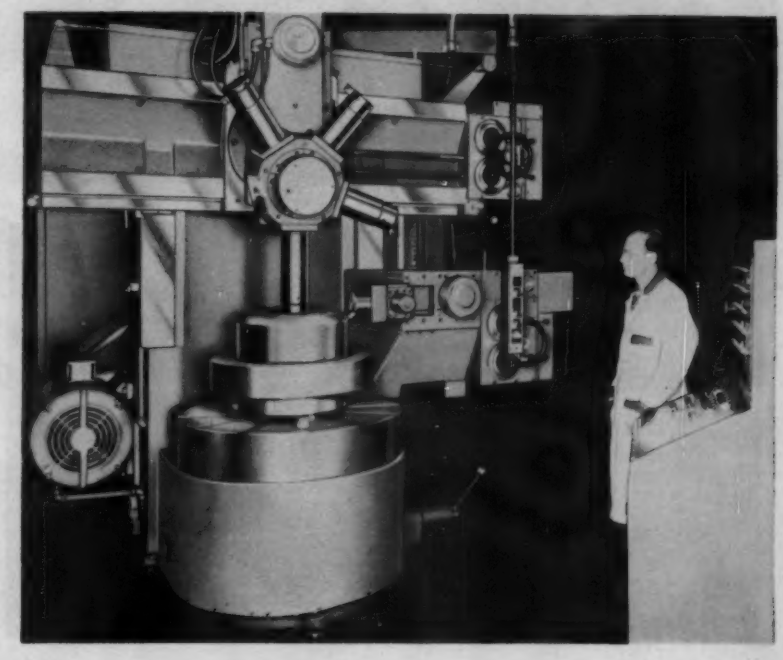
A 42-in. vertical turret lathe with five-position turret on the rail head and a right-hand four-position turret side head operates under numerical control. Nine different tools carried by the turrets are automatically controlled for tool position, power indexing, taper turning, boring, grooving, facing, and internal thread cutting.

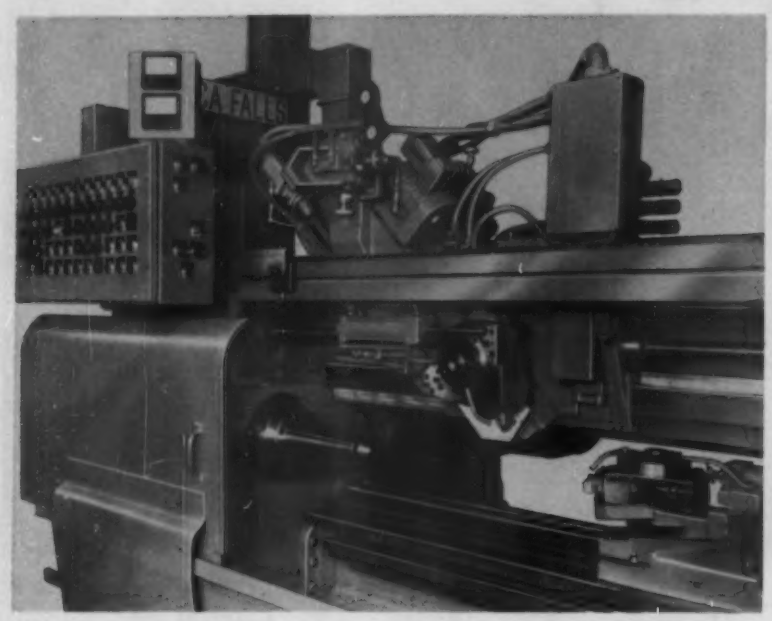
Cam-locked toolholders in the head turret speed tool change for small-lot machining. The machine has 50 hp, a 42-in.-dia table, speed ranges from 6 to 320 rpm, and tool feed from 0.0007 to 0.578 ipm. Davis preset quick-change toolholders are included for fast and accurate tool setup.

Pendant controls and a "joy stick" are included for manual operations. Feed and power traverse can be engaged manually, by tape, or simultaneously by both control mediums.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 381

MORE DATA? Circle 70, inside back cover





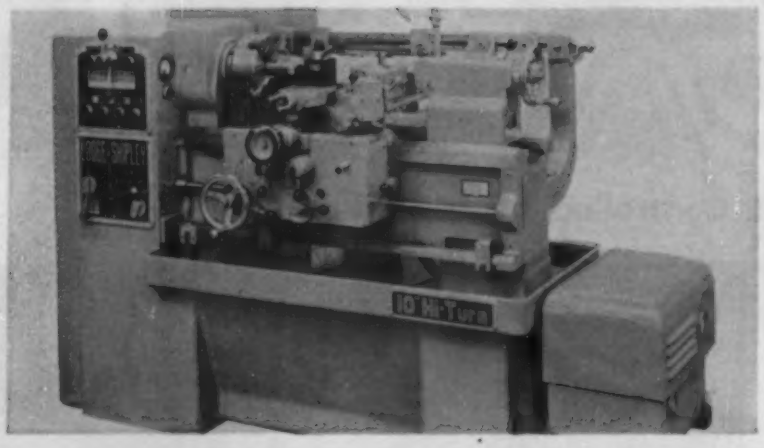
Seneca Falls Tracer Lathe Numerically, Templet Controlled

Model LQ automatic tracer lathe for high-production output can be fitted with a number of production accessories. In one mode the machine has a rear tracer carriage with an automatically indexed tool block, a left-hand overhead tracer carriage, and a front squaring attachment with a thread-rolling tool. This applies to production of automotive front-wheel spindles. The rear tracer roughs and finishes the stem end of the work and faces, while the overhead tracer tool finishes an external face on the flange and pilot diameters.

In another mode, the lathe can be equipped with a servo-controlled overhead carriage acting from a templet. A two-axis servo-controlled carriage is mounted on the rear bed, and the machine has a multiple-speed and dual-rate mechanical feed. Motion, sequence, and speeds and feeds are numerically controlled.

Seneca Falls Machine Co, Seneca Falls, N Y—Booth 231

MORE DATA? Circle 71, inside back cover



Lodge & Shipley Copymatic Has Constant Cutting Speed

Model 1307 (10-in.) Hi-Turn, with 45° Copymatic and new constant cutting speed attachment, will demonstrate rough and finish turning of a conical-shaped bottle plunger (tooling used in glass bottle manufacture). This lathe is tooled with ceramic tool bits.

The universal constant cutting speed equipment, with L&S exclusive rack and pinion arrangement, produces the fine surface finish needed.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio—Booth 1046

MORE DATA? Circle 72, inside back cover

TAPE-CONTROLLED TURRET LATHE, the Factrol 101, features a magnetic-tape continuous-path control system. Operations controlled by tape include selection of hex turret position and square turret position; continuous-path position and rate control of both turret and toolpost for simultaneous straight, taper, or contour turning, boring, or facing; selection of one of 24 spindle speeds in a range from 18—1090 rpm. Tapes are easily prepared (AM/MM—Aug 8 '60, p76)—Gisholt Machine Co, Madison, Wis—Booth 1042

MORE DATA? Circle 73, inside back cover

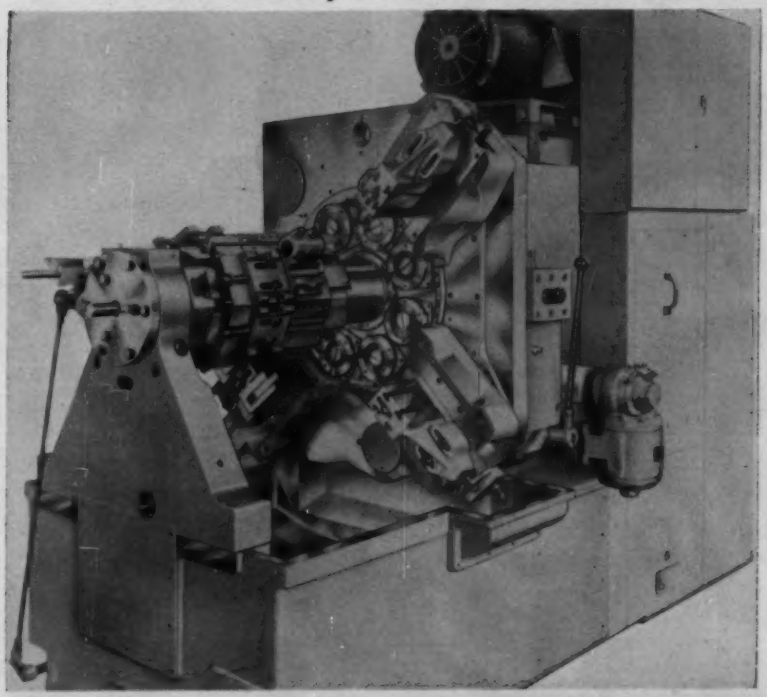
Baird Eight-Spindle Chucker Has Universal Slide

Baird Model 78H eight-spindle chucker has four new design features: a universal cross-slide, two longitudinal feeds, three individual spindle speeds, and the ability to stop and position the spindles. Speeds range from 150 to 1750 rpm.

Cross-slides are independently controlled for stroke and feed. Longitudinal tool slides are arranged for one or two cutting strokes and for separate operations such as milling, multiple drilling, tapping, broaching, or other secondary operations. The machine will single or double index and automatically load, chuck, and unload.

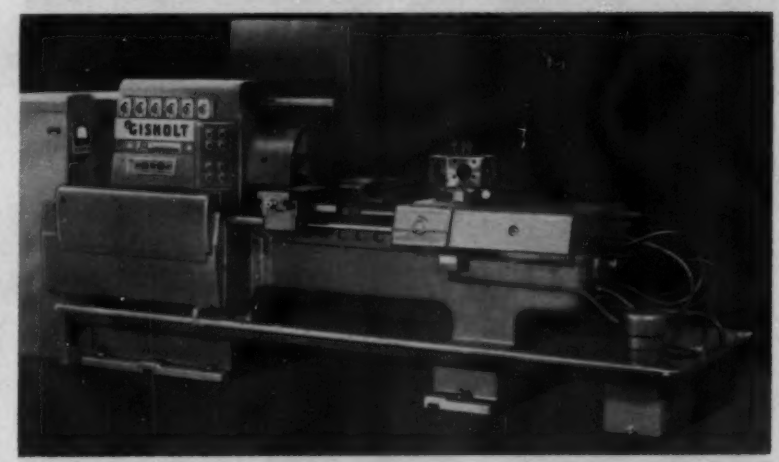
The Baird Machine Co, 1700 Stratford Ave, Stratford, Conn—Booth 1142

MORE DATA? Circle 74, inside back cover



AUTOMATIC - CHUCKING TURRET LATHE, Masterline 3F Fastermatic, can be set up in only 15 minutes through preselection of feeds, speeds, and machine functions. Control panel has six horizontal rows of selector switches, one row for each turret face, and ten vertical columns of switches for separate machine functions. Above the selector switches are the feed selection controls (AM/MM—Mar 21 '60, p154) —*Gisholt Machine Co, Madison, Wis*—Booth 1042

MORE DATA? Circle 75, inside back cover

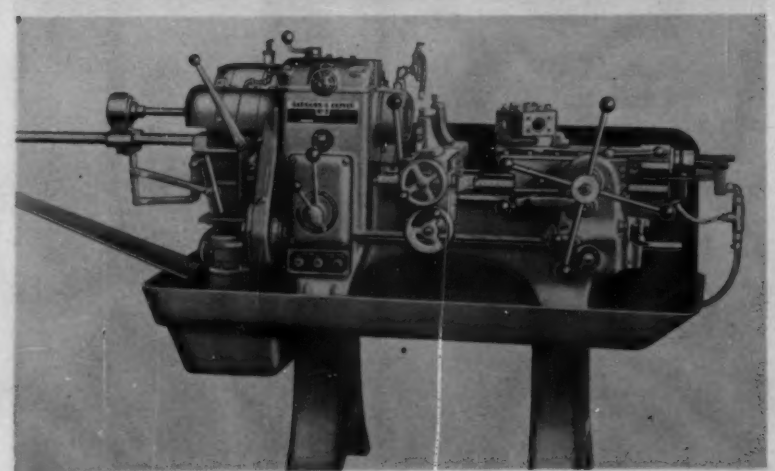


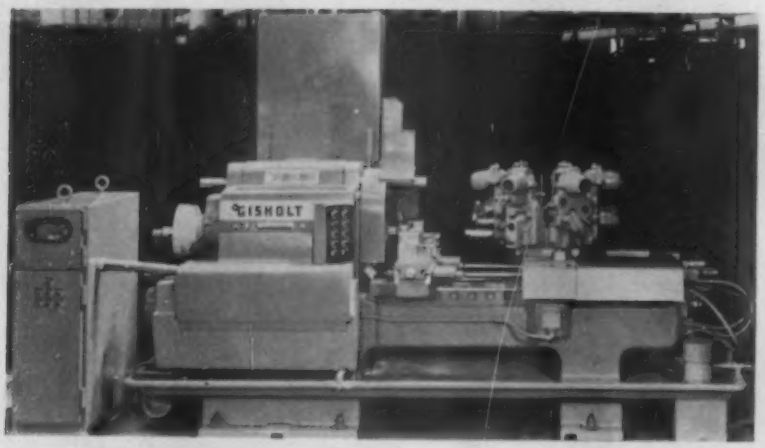
Bardons & Oliver Lathe Has Fast Headstock & Control

Ram-type turret lathe, Bardons & Oliver No. 2, features a new 3500-rpm headstock, and will be equipped with a remote control unit that automatically programs the forward-reverse of the spindle, high-low spindle speed changes, opening and closing of collet, and operation of the bar feed. Spindle capacity is 1—1¼ in.; swing over bed ways is 13½ in.

Bardons & Oliver, Inc, Cleveland 13, Ohio—Booth 741

MORE DATA? Circle 76, inside back cover





Gisholt Automatic Turret Lath Controlled by Punched Tape

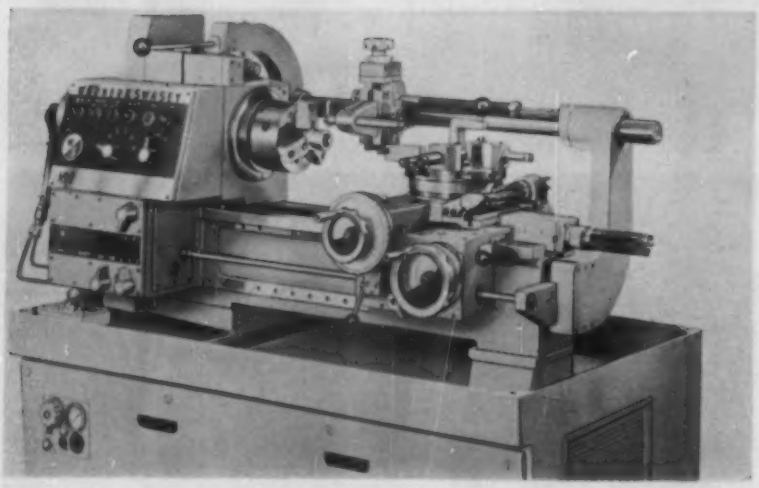
The Masterline 1F Fastermatic automatic-chucking turret lathe is controlled by a Westinghouse Prodac punched-tape control system comprising logic, scanning, and control of such functions as speed and feed selection and program sequence direction. Provision is also made for manual, check, and automatic operation.

One operator can easily handle several of these machines. Other features include ease of setup, elimination of human error, longer tool life, and consistent work quality.

This machine will be demonstrated machining cast-iron clutch hubs. Conventional automatic turret lathe tooling will be used, and two operations (front and back of part) will be completed with each complete index of the hex turret.

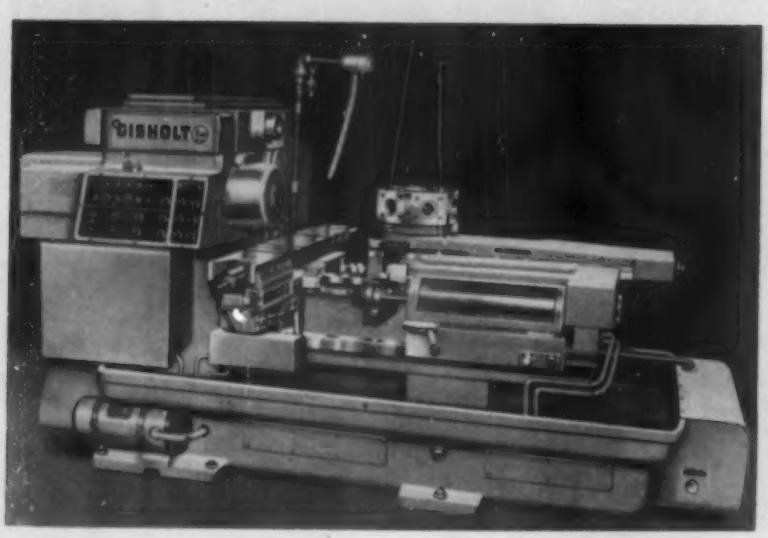
Gisholt Machine Co, Madison, Wis —Booth 1042

MORE DATA? Circle 77, inside back cover



PRECISION CHUCKING TURRET LATHE model in the new line of No. 2 Micro-Cut machines features a flat-type 8-station cross sliding turret with curvic coupling locating and locking mechanism and tangential T-slots for mounting tooling. Machine is powered by a two-speed constant torque 5 hp motor (*AM/MM*—June 27 '60, p147)—*Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio*—Booth 451

MORE DATA? Circle 78, inside back cover



AUTOMATIC TURRET LATHE, Masterline 5AR, is said to combine automatic-cycle efficiency with the versatility and quick setup of a hand-operated ram-type turret lathe. Operations that can be preset include selection of 16 spindle speeds, back feed, right or left-hand threading, cross-slide movement, collet chucking, and bar feeding (*AM/MM*—Apr 18 '60, p147)—*Gisholt Machine Co, Madison, Wis* — Booth 1042

MORE DATA? Circle 79, inside back cover

Cleveland Adds Tracing Attachment to Shaft Machine

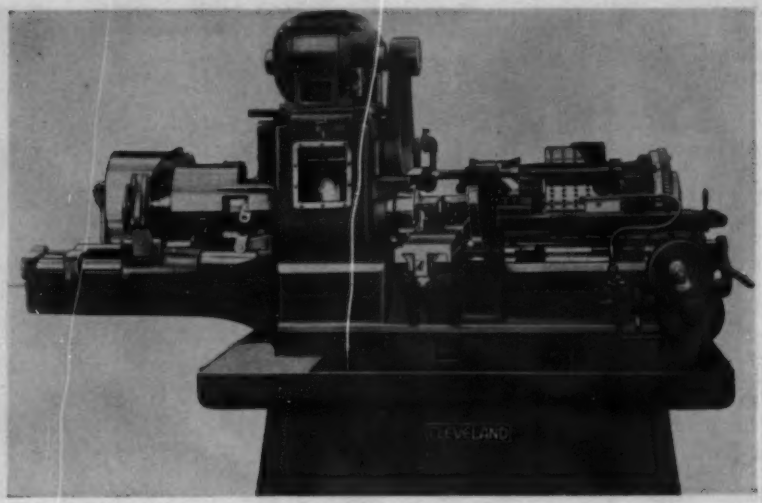
This 1⅝-in. Model B is not a turret type automatic, but was designed primarily for shaft, pin, stud, spindle, and arbor work requiring a number of turning and forming operations. The addition of the LeBlond Regal tracing attachment to this automatic bar machine offers new possibilities for all types of shaft and spindle machining.

At the Show, this Model B will be tooled to produce a mandrel from 7/16-in. drill rod. The machining operation includes gaging from a swinging gage stop, steady with carbide bushings while turning with the tracer and cutting off with a tool mounted on the rear cross slide. Production time is 23.1 sec per piece.

The machine has 20 spindle speeds ranging from 127—2017 rpm.

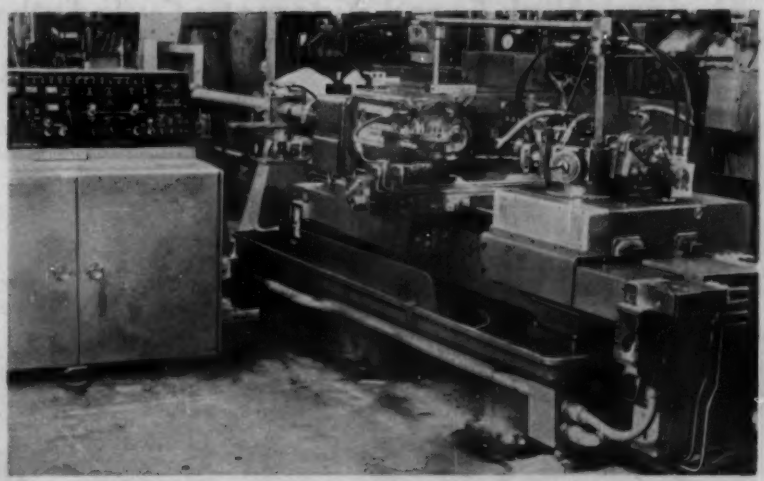
Cleveland Automatic Machine Co, 4932 Beech St, Cincinnati 12, Ohio —Booth 900

MORE DATA? Circle 80, inside back cover



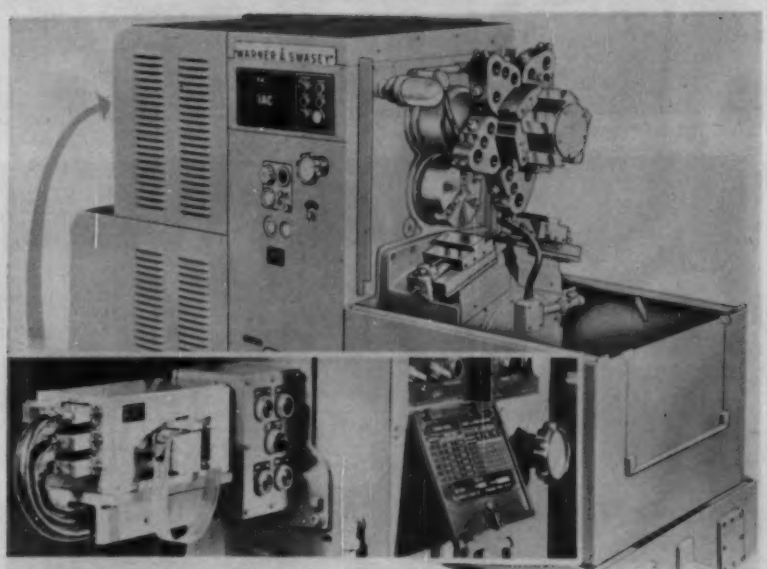
NUMERICALLY CONTROLLED TURRET LATHE can be set up as either a bare machine or a chucker in 10 to 15 minutes. Designed for short runs (1 to 50 pieces), machine positions within ±0.001 in., repeats to ±0.000,5 in. Drive motor is 30 hp on this 2½-in.-dia x 24-in. machine. Spindle speeds are 40 to 2000 rpm in 24 steps. Feed rates for carriage and saddle are 0.750 to 30.0 ipm in 16 steps. Cross-slide operates at half these rates. Tape input information can be adjusted by manual dial on panel (AM/MM—Jul 25 '60, p104)—*Jones & Lamson Machine Co, Springfield, Vt* — Booth 839

MORE DATA? Circle 81, inside back cover

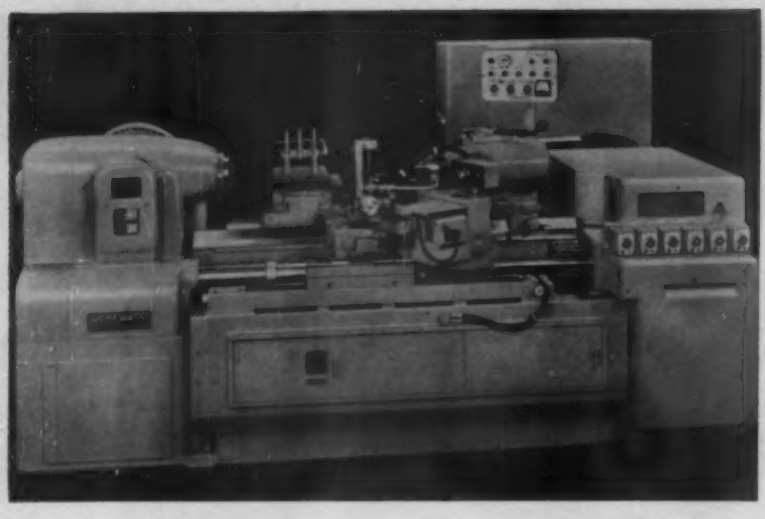


1AC SINGLE SPINDLE CHUCKING AUTOMATIC with tape control system (optional) that controls all operating functions. When equipped with tape control, the machine still remains quickly "convertible," so that operator can switch from tape programming to standard electro-mechanical control arrangement at any time (AM/MM — June 27 '60, p147) — *Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio*—Booth 451

MORE DATA? Circle 82, inside back cover



TURNING—Machine Tool Exposition in Print



Monarch High Speed Automatic Cycle Lathe Features 4-Cut Cycle, Hydraulic Carriage

Model 21-H Mona-Matic is particularly adapted to the machining of work pieces requiring heavy stock removal. When furnished with a four-cut cycle, there is no reasonable limitation to its stock removal. The machine may be supplied for two- or one-cut cycle work.

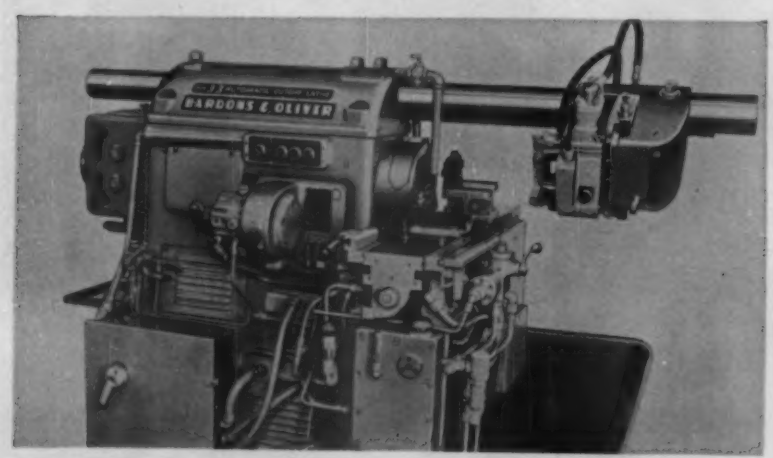
A precision air-gaging tracer system, called Air-Gage, controls the hydraulically powered tool slide from a master template. With stylus pressure against the template of only 5-6 oz, the accuracy of template shape reproduced is within ±0.001 in.

Front carriage feed and traverse are both hydraulic, with the control cylinder mounted in the apron. Feed rates are infinitely variable from 1-40 ipm; carriage traverse is 200 ipm; facing and forming slide feed rate is ½—20 ipm; traverse is 90 ipm.

Three spindle speed ranges are offered, highest has top speed of 2760 rpm. The machine is available in 18, 30, and 42-in. center distances. Swing over the bed is 15 in.; over the front slide, 9 in.; and over the facing and forming slide, 9½ in.

Monarch Machine Tool Co, Sidney, Ohio—Booth 701

MORE DATA? Circle 83, inside back cover

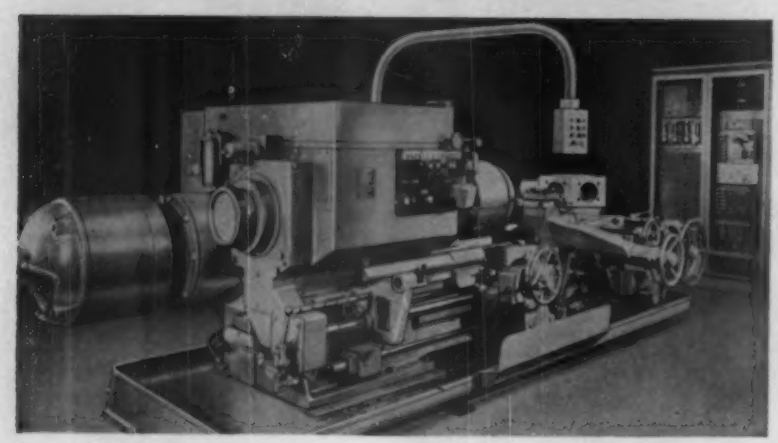


B&O Cutoff Lathe Features Time Delay

Bardons & Oliver automatic cutoff lathe, No. 33, is equipped with several new attachments. The positive-stop slide attachment with time delay permits forming to very close tolerances. Direct-acting remote control unit on the stock stop permits cutoff of unlimited lengths.

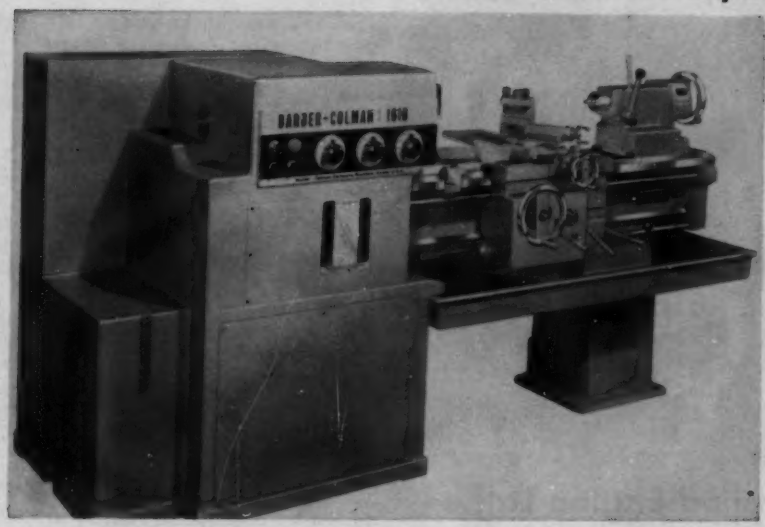
Bardons & Oliver, Inc, Cleveland 13, Ohio—Booth 741

MORE DATA? Circle 84, inside back cover



SERVO-TAPE TWO-AXIS NUMERICAL CONTOUR attachment for both carriage and saddle aprons of a 4-A turret lathe handles complex tape controlled contouring work up to its full dimensional capacities (AM/MM—June 27 '60, p147)—*Warner & Swasey Co, 7501 Carnegie Ave, Cleveland 3, Ohio*—Booth 451

MORE DATA? Circle 85, inside back cover



Barber-Colman High-Speed 16-in. Lathe Designed for Turning, Facing, Boring

Model 1610 lathe is designed specifically for high-speed precision turning, facing, and boring, and is available with swings of either 16½ in. (standard) or 20 in. Controls, feeds and speeds, and principles of design all are predicated on specialization —the machine has no gearbox or threading equipment

Driven by a 6½-hp dc motor, the 1610 provides infinitely adjustable feeds and speeds. Three ranges of spindle speeds are available, with maximum speeds of 1500, 2000 or 2500 rpm, at customer option. Feeds of 0.0001—0.488 ipr are possible, depending upon spindle speed. Both feeds and speeds are instantly adjustable, even under cut, simply by turning the dials on the headstock.

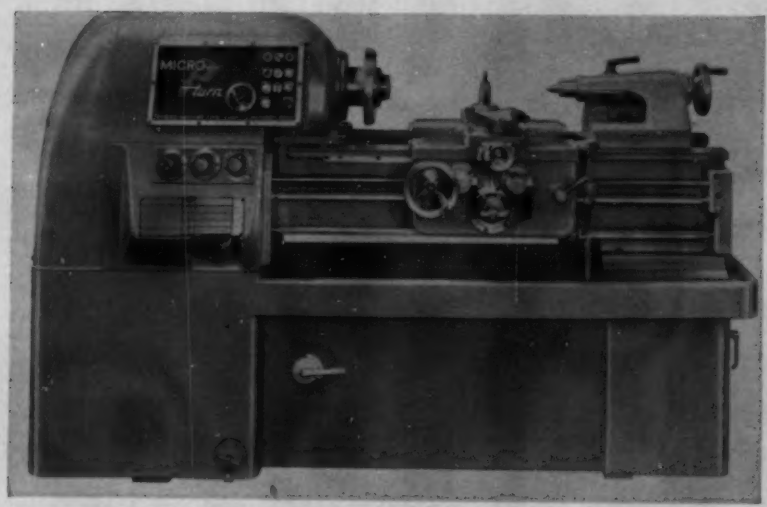
A headstock-mounted load meter tells the operator when he is taking maximum advantage of the power of this lathe. Positive micrometer carriage stop and 5-position, turret-type automatic feed stop help increase productivity.

When equipped with a hydraulic tracer (available as extra equipment), the lathe can be purchased for approximately the same price as an equivalent toolroom lathe without tracer. The tracer operates from 0-90° with the work axis, and controls the machine consistently within 0.001 in. on diameter or length.

Machine is available with center distances of 30 in (illustrated) 42 in., and 54 in.

Barber-Colman Co, Machine Tool Div, Rockford, Ill—Booth 923

MORE DATA? Circle 86, inside back cover



Nebel Lathe, with Infinitely Adjustable Speeds, Has Constant Horsepower Drive

Micro-Turn lathes, which offer infinitely variable spindle speeds from 43—3500 rpm, have a new coaxial headstock design for delivery of maximum horsepower and smoothness in roughing or finishing. The infinite speed selection of the MT 1308 and MT 1510 is conveniently controlled by increase and decrease pushbuttons, with indication on a direct-reading tachometer.

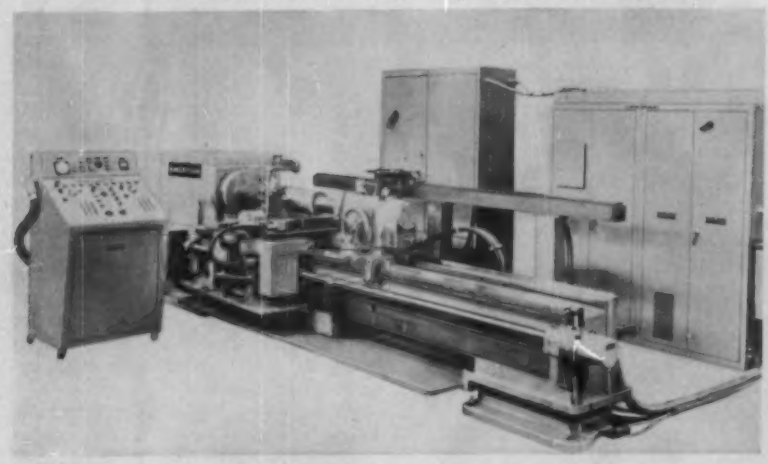
The infinite speed range plus constant horsepower are provided by a mechanical speed variator driven by an ac motor equipped with hardened alloy steel members to insure long life. Since the drive gives constant horsepower through the entire speed range, high torque is insured at the low speeds for heavy cutting. A built-in torque responsive mechanism prevents slippage under starting or shock loads.

The new coaxial headstock is designed around a single shaft surrounded by a floating type ring and planetary gear arrangement. Inherent benefits of this construction are low inertia effect for quicker acceleration and deceleration, prolonging clutch and brake life; simplified alignment further aided by a self-centering effect; and fewer revolving parts for greater smoothness and efficiency of power transmission.

These Micro-Turn lathes feature a double-wall one-piece enclosed apron, an exclusive feed converter in the apron, and flame-hardened, ground carriage and tailstock ways.

Nebel Machine Tool Corp, 3401 Central Parkway, Cincinnati 25, Ohio —Booth 1319

MORE DATA? Circle 87, inside back cover



Tape-and-Tracer-Controlled Engine Lathe Introduced by American Tool Works

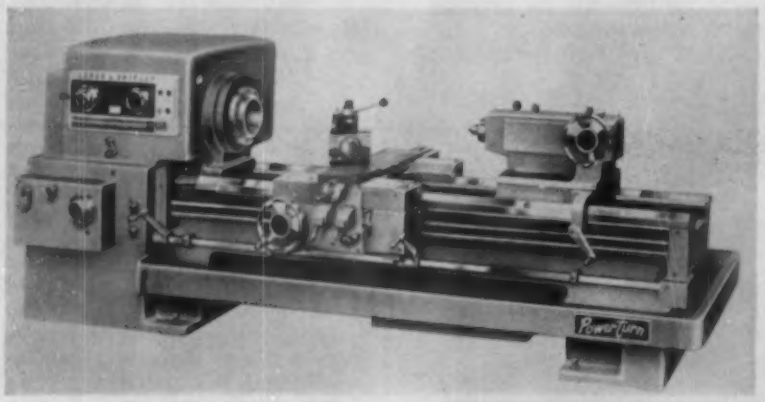
American 2509 combination numerically and tracer-controlled engine lathe eliminates complex and expensive computing and programming equipment. Numerical control will be used for point-to-point cuts; an electronic tracer for contours. This will be considerably less expensive than full path control, yet will permit the lathe to do step shafts as well as contours, fillets, radii, tapers, and other free forms.

Lathe is powered by a 50-hp motor. There are 20 spindle speeds from 50—900 rpm, and 20 feeds from ½—16 ipm. Both speeds and feeds are programmed into the General Electric 8-channel punched-tape control system. Positioning of the square tool turret is under tape control. The tracer system utilizes a General Electric 360° (two-dimensional) unit and a flat templet.

Operator simply loads the machine, pushes the start button, then unloads the machine after the complete cycle. All other functions are under tape or tracer control. Positioning of the templet fillets is simplified by pushbutton control of the carriage and slide movement. This enables the operator to position.

American Tool Works Co. Pearl St at Eggleston Ave, Cincinnati 2, Ohio—Booth 381

MORE DATA? Circle 88, inside back cover

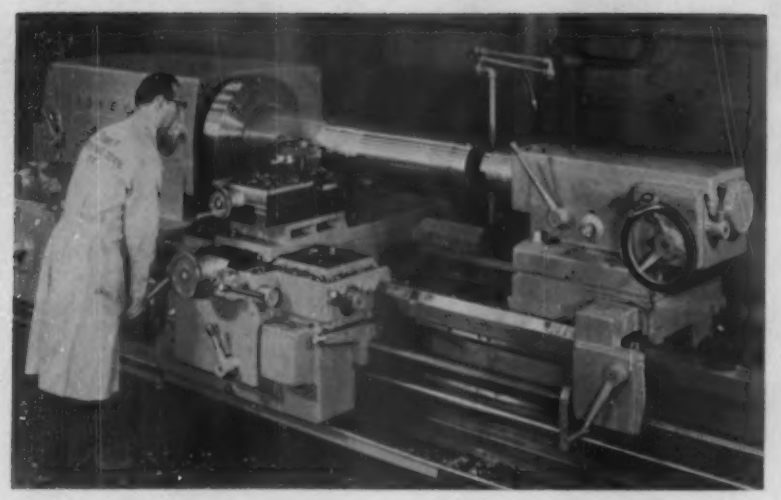


Lodge & Shipley Powerturn Handles Long Workpieces

Powerturn Hollow-Spindle Lathe, Model 2516 (20-in.), has 11½ in. hole through spindle. Designed for oil field work, this lathe is now widely used in many industries where long workpieces are found. The hole through spindle allows chucking of workpieces which are longer than the normal 120 in. center distance, but between center work can also be performed.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio—Booth 1046

MORE DATA? Circle 89, inside back cover



SIDNEY EXTRA-HEAVY-DUTY LATHE, 4025 series, provides 36 spindle speeds from 5-800 rpm, and 75 hp in all speed ranges. Gearbox has 60 threads and feeds. Lathe, one in the company's all-new line, is available in swings of 40½, 45½, and 49 in. (AM/MM—Jul 11 '60, p149)—*Sidney Machine Tool Co, Sidney, Ohio*—Booth 1440

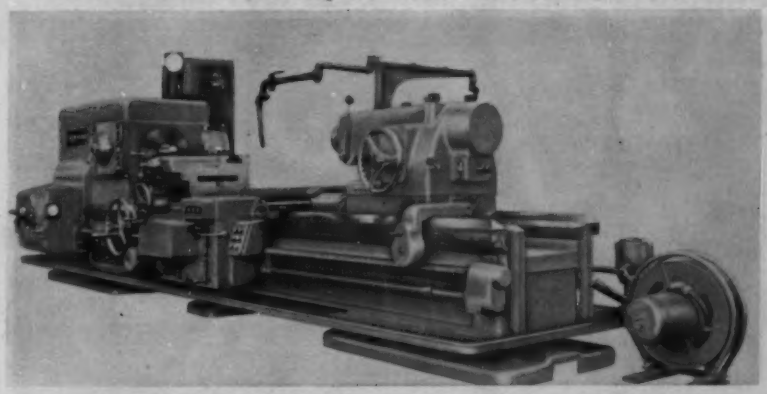
MORE DATA? Circle 90, inside back cover

Pre-Selection of 48 Speeds Offered by American Lathe

American 4025 Pre-Select Lathe has a spindle-speed range of 6—700 rpm and permits pre-selection of any of the 48 speeds. The pre-selective hydraulic gear shifting is absolutely silent because the gears oscillate during shifting, thus there can be no clashing.

Operator can control cross and longitudinal feed through pushbuttons at the apron. There are duplicate pushbuttons at both the head and the apron to control pre-selected spindle speed shift.

The heavy-duty toolholder takes a 2x2-in. tool. Front spindle bearing has a radial load capacity of 80, 580 lb at 100 rpm; the center spindle bearing, 61, 600 lb at 100 rpm. This capacity permits very heavy chucking work.



American Tool Works Co. Pearl St at Eggleston Ave, Cincinnati 2, Ohio—Booth 381

MORE DATA? Circle 91, inside back cover

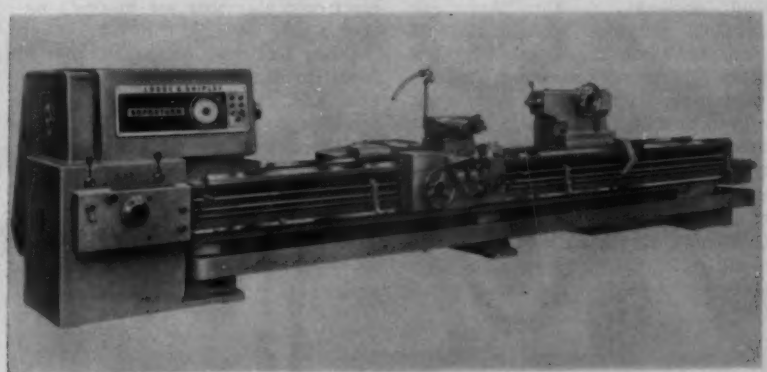
Lodge & Shipley Superturn 20-in. Lathe Turns Carbides, Ceramics

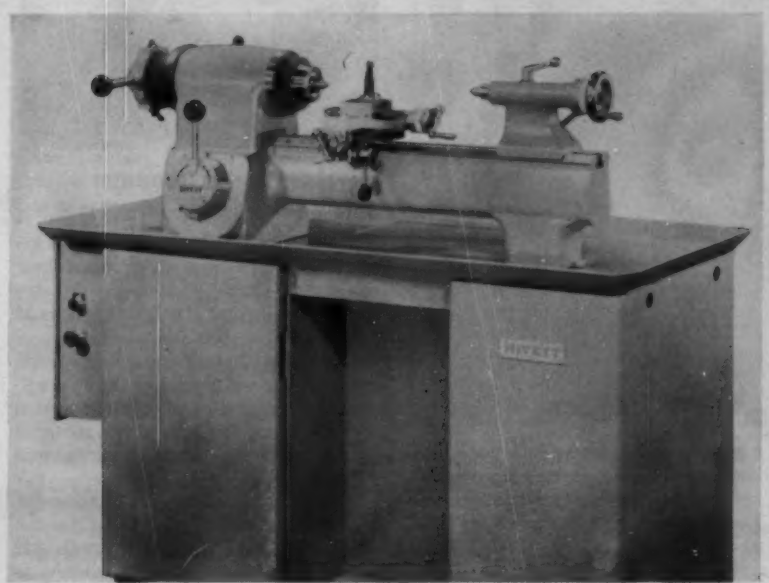
This new Model 2516 20-in. preselect lathe with 4-way power rapid traverse is the latest addition to the L&S lathe line. It is specifically designed for the demands of present and future tooling with carbides, ceramics, etc. Therefore, it has extra ruggedness, higher horsepower, and other features to adapt it to this use.

In demonstration at the show it will do rough turning of a large, stepped roller shaft. In this operation the lathe will take rough cuts and make effective use of ceramic tools.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio—Booth 1046

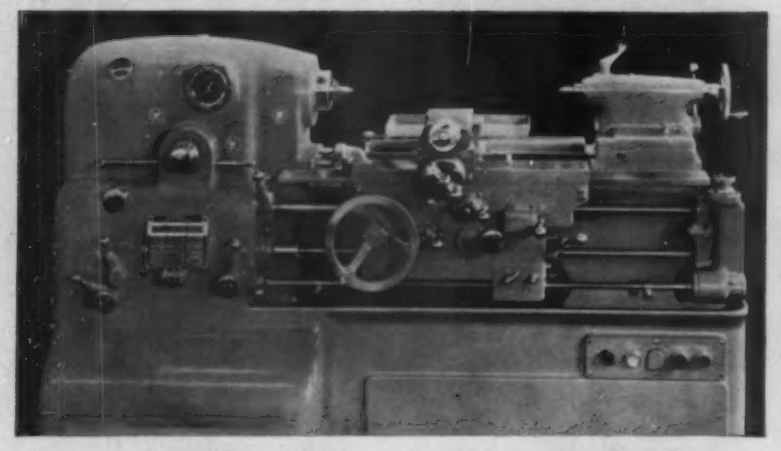
MORE DATA? Circle 92, inside back cover





RIVETT "ONE-MOTION-CONTROL" SPEED LATHE, 60 Series, operates at up to 4800 rpm, is capable of instant speed change, stop, and reverse. Double-bevel bed centers the headstock with the tailstock. A dovetail aligns the compound slide rest (AM/MM—June 13 '60, p168)—*Rivett Lathe & Grinding, Inc, Brighton 35, Mass*—Booth 1210

MORE DATA? Circle 93, inside back cover



Monarch Offers 10-in. Precision Lathe for Toolroom, Super-Accurate Manufacturing

New 10-in. Model EE lathe has infinitely variable spindle speed range of 5—3000 rpm, standard, or 6.5—4000, optional. A 3-in. American standard Camlock spindle nose is used for quick, rigid, and accurate chuck and fixture mounting. The machine is proficient for toolroom work, or for operations on such parts as small jet, missile, instrument, electronic, and camera components.

The control circuitry is in the form of a plug-in module for ease of maintenance. Only three tubes are used along with silicon diodes and other static types of electrical components. Thermostatic control is provided to stop the motor should the temperature of the compartment (in which electronic elements are housed) exceed a safe level.

Other features: 60 threads and 50 feeds through a totally enclosed gear box and end gearing; cross feed screw and leadscrew are induction hardened and ground; all gears are hardened and precision finished; lubrication is automatic; bed ways are flame hardened and precision ground.

Monarch Machine Tool Co, Sidney, Ohio—Booth 701

MORE DATA? Circle 94, inside back cover

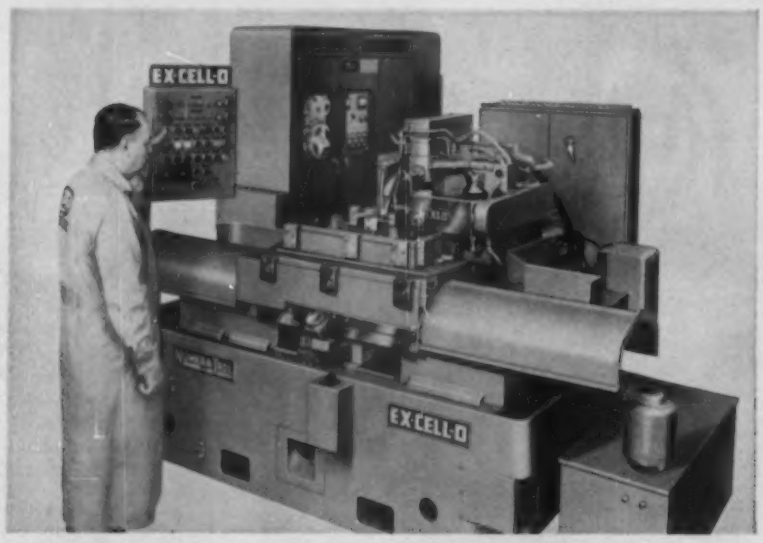
Cincinnati Hydraguide Control Is Compact Tracer Mechanism

A tracing attachment that mounts with minimum interference and alaows all normal lathe operations, the Hydraguide provides automatic duplication with sensitive control because of short hydraulic linkage. All controls, templet, stylus, and tools are on the operating side.

The control operates from flat templets to guide turning, boring, shouldering, radius-cutting, and facing operations. Unit is suitable for application to Hydrashift lathes (*AM/MM*—Nov 2 '59, p141).

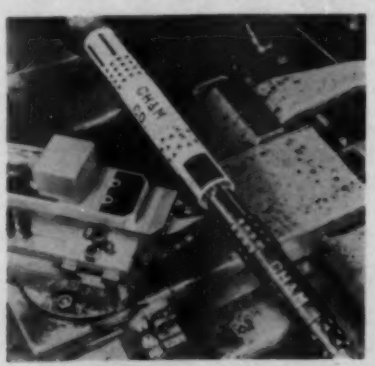
Cincinnati Lathe & Tool Co, Cincinnati 9, Ohio—Booth 934

MORE DATA? Circle 96, inside back cover



EX-CELL-O MODEL 922 NUMERA-TROL is a two- or three-dimensional tape controlled machine with interchangeable turning and boring or grinding heads. Design is such that unit will operate from any high-performance numerical-control system. Pulse value is 0.000,025 in. Heavy, rigid bed is moved by ball-recirculating leadscrews (AM—Dec 14 '59, p147)—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32*—Booth 946

MORE DATA? Circle 95, inside back cover



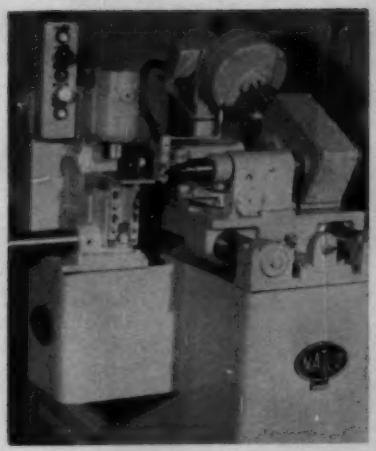
Cleveland Device Translates Data from Drawings into Metal

The Data Transcutter, which will attach to lathes and other machines, translates data fed from photographs, drawings, templets, or tape into metal during machining.

This tool will machine axial grooves, raised beads or keys, various art designs, and complex data as well as oil-retaining surfaces while the part is undergoing normal machining processes.

Cleveland Hobbing & Machine Co, Div of Textron, Inc, 1311 Chardon Rd, Cleveland 17, Ohio—Booth 642

MORE DATA? Circle 97, inside back cover



New NATCO Cuts Cost of Centering Operations

This low-cost machine is said to reduce materially the cost of centering while it provides more accurate centers on multiple part turning jobs. It is recommended, by its maker, for manufacturers using tracer and copy lathes.

The machine mills workpiece ends, deburrs them, and drills centers within 0.002 in. of specified depth. It will handle workpieces up to 3 in. dia and 3 ft long, or longer with an extension work rest.

National Automatic Tool Co, Inc, Richmond, Ind—Booth 1205

MORE DATA? Circle 98, inside back cover

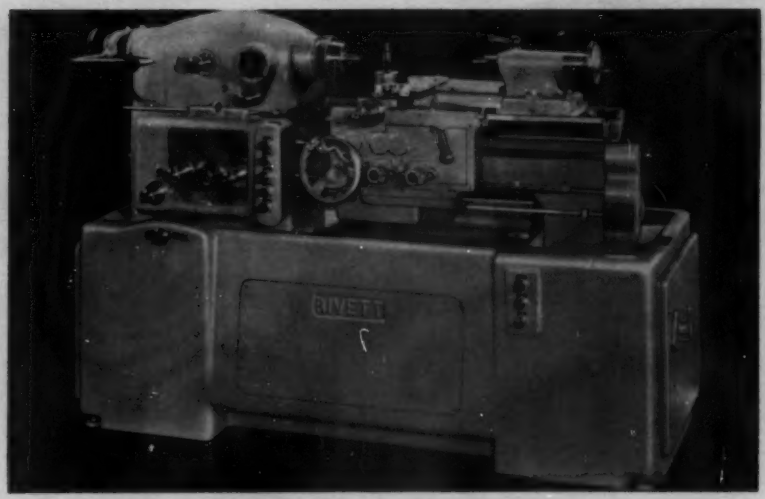
New Acme-Gridley 6-Spindle Bar Automatic Has 20 Improvements

New from the ground up, the 9/16-in. RN-6 offers over 20 design improvements. Idle time of the new machine has been reduced to approximately half that of its predecessor, because its spindle speed has been approximately doubled. A new power shaft alignment adapts the machine to high-speed production with modern cutting tools.

Other new features are: disk cams for positive return attachments that permit easy changing and variation of applications; headstock face casting completely machined for accurate placement of attachments; faster stock stop for tool clearance in sixth position; high and low speed cams located at gear box end of machine; improved operator comfort through providing toe space all around the pan.

National Acme Co, 170 E 131 St, Cleveland 8, Ohio—Booth 781

MORE DATA? Circle 99, inside back cover

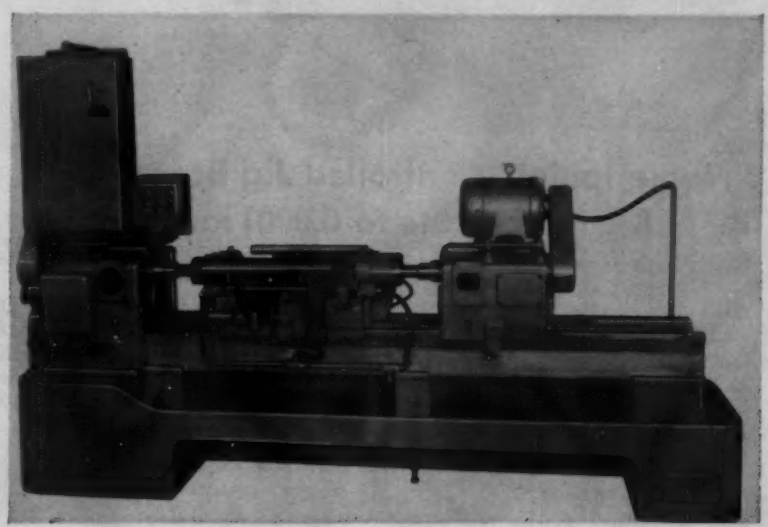


Rivett Model 1020S Toolroom Lathe Suitable for Carbide Tooling

Model 1020S combination lathe is for engine and instrument work. Sensitivity is said to hold tolerance of 0.0004 in., and strength adequate for carbide tools. The machine takes a ¼-in. cut at 0.02-ipr feed in CRS. Models with 20 or 30-in. centers. Double-duty machine features versatility.

Rivett Lathe & Grinder, Inc, Brighton 35, Mass—Booth 1210

MORE DATA? Circle 100, inside back cover



Seneca Falls Model CS Machine Does Drilling and Centering on Shafts

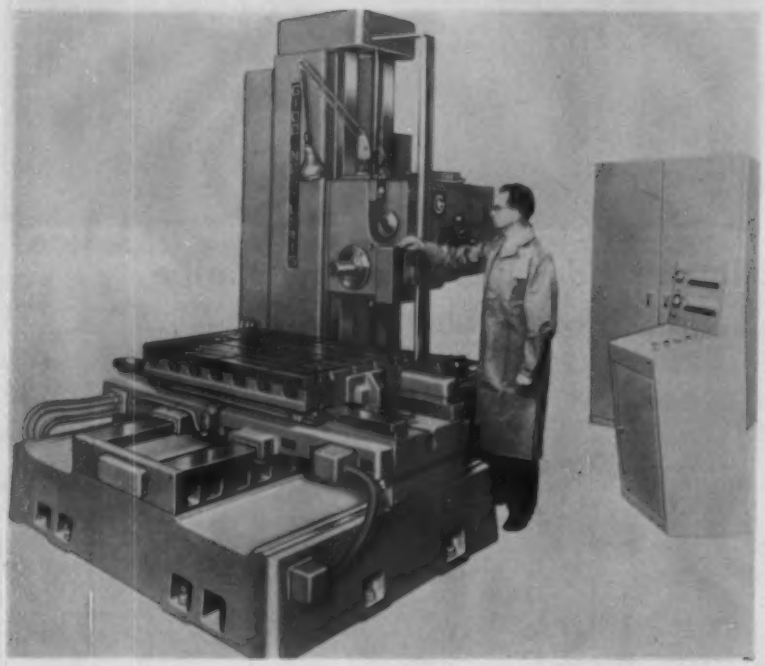
Automatic drilling and centering machine prepares shaft stock for operations on tracer and automatic lathes. Unit is hand loaded, fed by conveyor, or loaded by walking-beam conveyors (illustrated). With walking-beam feed, shafts arrive by conveyor, and two arms handle a finished and a rough piece simultaneously, loading new parts into special vises on the centering machine. The unit also is capable of doing chamfering work.

Seneca Falls Machine Co, Seneca Falls, N Y—Booth 231

MORE DATA? Circle 101, inside back cover

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Boring



"Numeripoint"-Controlled Jig Borer By G & L is Accurate to 0.0001 in.

Numerically tape-controlled 3-in. jig boring and milling machine does toolroom and production work at substantial savings. Machine has 10 hp, fast positioning, 16 in. of saddle travel, and feed rates of 0.012 to 120 ipm. Saddle depth is positioned electrically; spindle speeds range from 12.6 to 1600 rpm.

Nitralloy spindle is mounted in preloaded tapered roller bearings, with bull gear close to front of spindle bearing to reduce torsional deflection, and to act as flywheel.

Standard remote control is by "joystick" that operates positioning, feed, and rapid traverse of head and table. Tool change is speeded by drawbolt. Scales and verniers help in table, head, and saddle positioning.

Paper-punched-tape and dial-in positioning control hole-to-hole movements and rotary indexing when the machine is numerically controlled. An Inductosyn scale feedback system contributes to positioning speed two to three times as fast as other controls. The machine is available with dial-in control, with a numerical tape-control reader to be added later if desired.

Tape control also applies to auxiliary functions such as milling feed, speed, and mode, including two grades of roughing and one finishing.

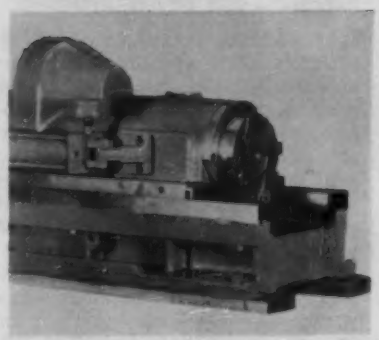
Saddle ways and center bedways are flame hardened, and frame construction is heavily ribbed. Antifriction supports keep the table accurate at extended positions. Way locks are antifriction wedges.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA? Circle 102, inside back cover

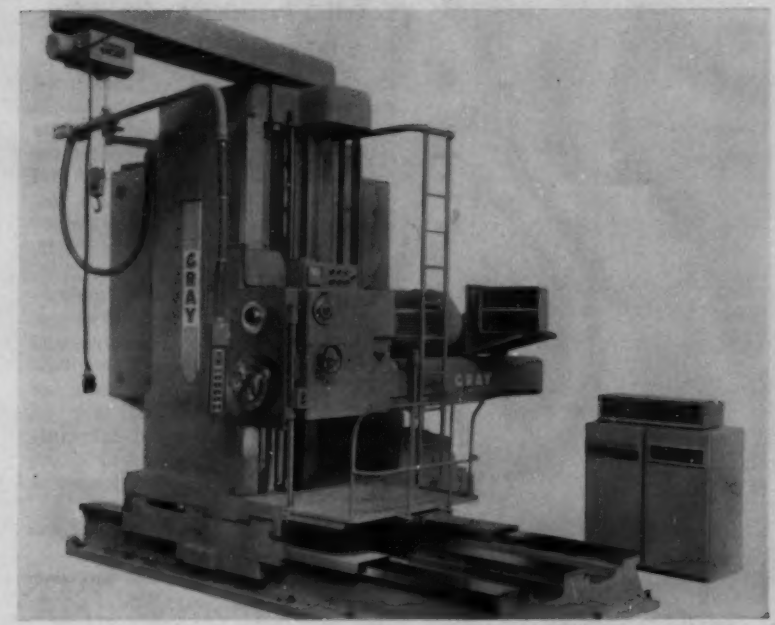
EXHIBITORS SHOWING BORING EQUIPMENT

BOOTH	EXHIBITOR
543	Atlantic Machine Tool Works, Inc Newington, Conn
1326	The Cincinnati Gilbert Machine Tool Co Cincinnati 23, Ohio
431	DeVlieg Machine Company Royal Oak, Michigan
946	Ex-Cell-O Corporation Detroit 32, Michigan
800	Fosdick Machine Tool Company Cincinnati 23, Ohio
1320	Giddings & Lewis Machine Tool Company Fond du Lac, Wisconsin
924	The Heald Machine Co Worcester 6, Mass
839	Jones & Lamson Machine Tool Co Springfiled, Vt
824	W B Knight Machinery Co St. Louis 8, Mo
1229	The Lapointe Machine Tool Co Hudson, Mass
482	Pope Machinery Corp Haverhill, Mass



MODEL 168 BORING HEAD, with solid housing working in slide, provides a rigid mounting of spindles for large tools working to close tolerances. It is also available with a coolant distributor for gun reaming. Max stroke is 7 in. with long stroke unit (shown) or 3½ in. with standard model 22 drilling unit—*Kingsbury Machine Tool Corp, Keene, NH*—Booth 713

MORE DATA? Circle 103, inside back cover



Boring, Drilling, and Milling Machine Suited for Rugged Carbide Milling

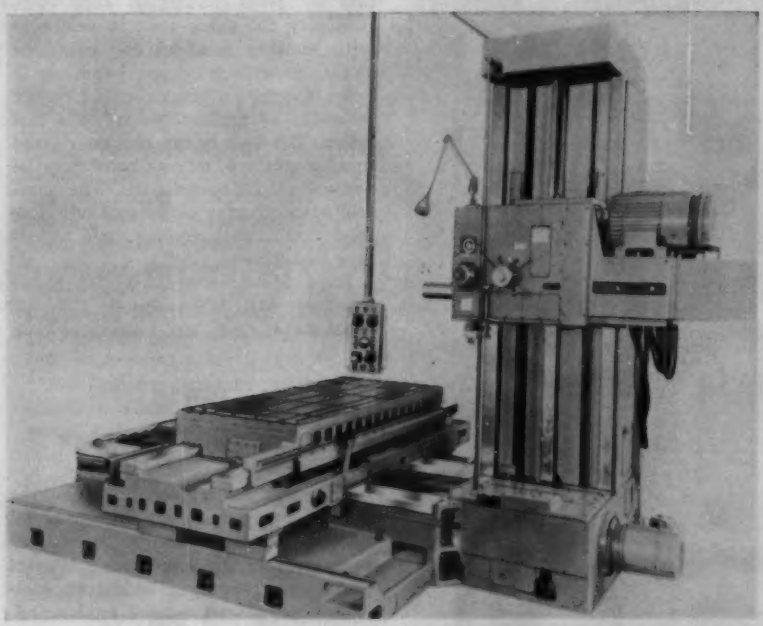
Model 660 FC horizontal boring, drilling, and milling machine has many features designed to increase machine productivity in high-speed carbide milling. One of the new features is the Televersal attachment, which permits low mounting, resulting in constant rigidity, and permitting heavier feeds and faster cuts. The 16-in.-dia quill has an axial adjustment of 18 in. The adjustable three-spindle workhead swivels.

Specifications include 6-in.-dia spindle, 60-in. axial bar travel, 72-in. vertical head travel, 96-in. column travel on runway, 24-in. column cross-travel, 50-hp spindle motor providing speeds up to 900 rpm.

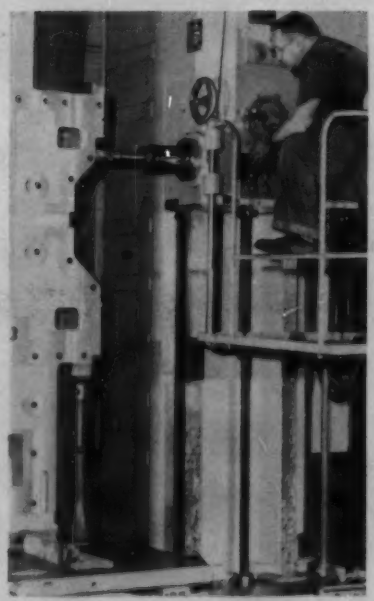
The most outstanding extra feature is the Gray Space Setter numerical control system, a system that offers progressive steps to full control by simply adding building-block control elements (*AM/MM*—Mar 21 '60, p165).

G A Gray Co, 3611 Woodburn Ave, Cincinnati 7, Ohio—Booth 1350

MORE DATA? Circle 104, inside back cover



GIDDINGS & LEWIS HORIZONTAL BORING, drilling, and milling machine, table-type, has provision for 5 or 6-in. spindle, 30 hp or more, and may be operated with Numeripath or Numeripoint punched-paper-tape control. Unit has "joystick" control of feeds, column, and headstock; three-way column, and dial operation (AM/MM—April 18 '60, p145)—*Giddings & Lewis Machine Tool Co, Fond du Lac, Wis*—Booth 1320 MORE DATA? Circle 105, inside back cover



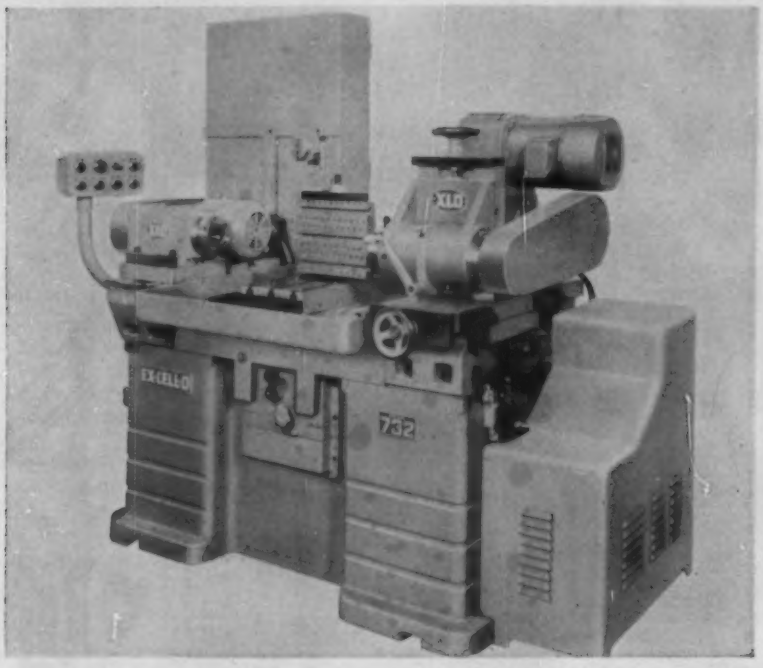
Floor-Type G & L Horizontal Machine Does "Numeritrol" Boring, Milling, Drilling

Punched-tape control on Giddings & Lewis model 3045 operates the machine for point-to-point boring and drilling, drilling and tapping in bolt circles, and milling. Tape control works in conjunction with automatic cycling and spindle depth control.

The machine has 25 hp, digital dial for preselection of head and column position, preselection of feeds and speeds, and 10-ft travel on runway. Vertical travel is 8 ft. The 5-in. spindle has 42 in. of travel.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA? Circle 106, inside back cover



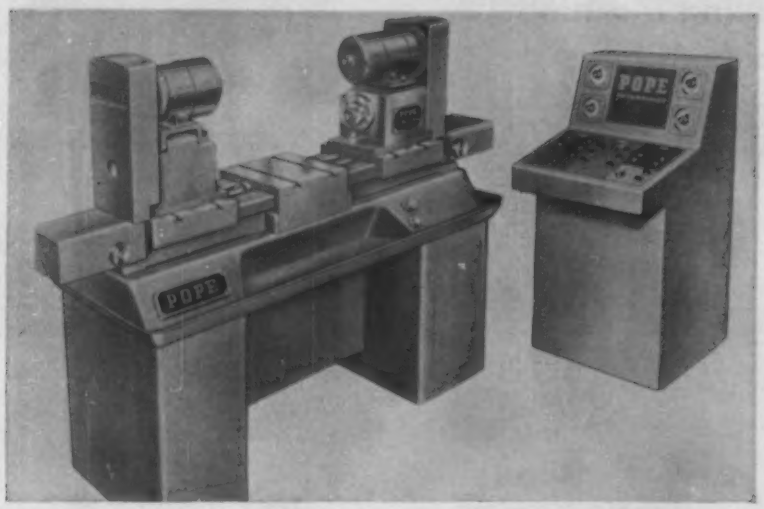
Ex-Cell-O Precision Boring Units Have Greater Rigidity, Accuracy

Ex-Cell-O hydraulic horizontal boring machines in four new models feature increased ribbing in bases and tables, temperature-controlled hydraulic panels, and relocated and redesigned table stops for more accurate repeatability. These are models 731, 751 (single-end) and 732, 752 (double end).

Machines are for precision boring, turning, facing, counterboring, chamfering, grooving, recessing, and trepanning to maximum dimensional stability. Power is manually or automatically controlled, and all machines can be adapted to point-to-point numerical control or incorporated in an automated production line.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32—Booth 946.

MORE DATA? Circle 107, inside back cover



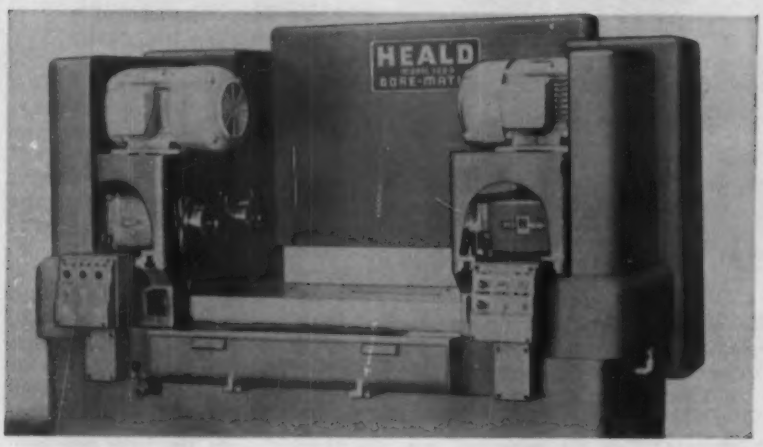
Pope Super-Precision Boring Machine Accurate Within Millionths

Accuracy within 20 millionths is claimed on hole roundness for the Pope Model 10-6 double-opposed boring machine. Two moving heads are dynamically balanced for operation by 1-hp motors at 3600 rpm. Basically the same unit is available with another head at any required angle, or with only one head.

An electric unified control center provides automatic cycling and fast setup. The two heads can be started in synchronism, or one head may be controlled independently. The control also governs rapid motions, fine feed rate, dwell, coolant, and auxiliary equipment.

Pope Machinery Corp, 261 River St, Haverhill, Mass—Booth 482

MORE DATA, Circle 108, inside back cover

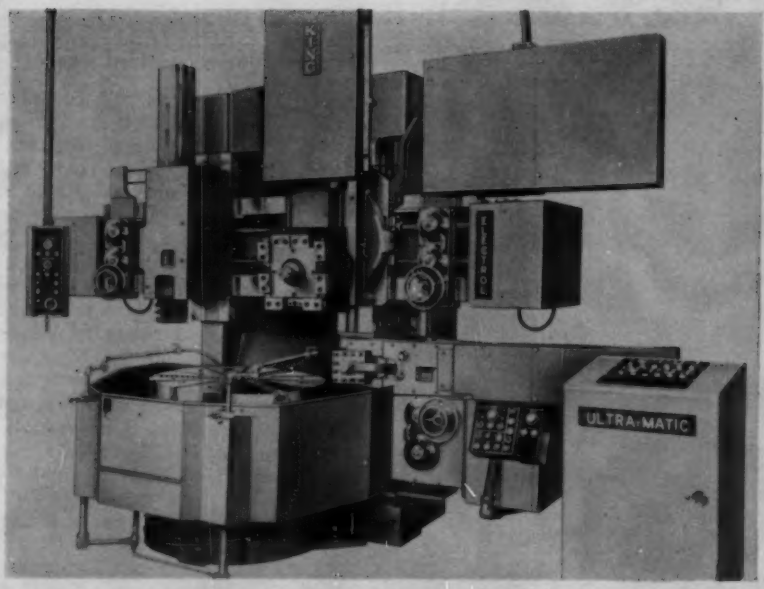


Heald Boring Unit Controls Spindle Temperature

New Bore-Matic, Model 322A, has only piston and cylinder in machine base; heat-producing hydraulic units, valves, and piping are positioned externally for better tolerance control and easier servicing. Infinitely variable boring head setback enables optimum tooling and work relationship.

The Heald Machine Co, 13 New Bond St, Worcester 6, Mass—Booth 924

MORE DATA? Circle 109, inside back cover



King Vertical Boring Mill Provides Automatic Control of Full Machining Cycle

This 46-in. Ultramatic vertical boring and turning machine features the Ultramatic programming device which provides completely automatic control. Sequence of movements for each head is set up on an individual patchboard by means of jumper cords. These boards are then placed in the control console, which contains the automatic cycling electrical controls. With patchboards and tools in place, stop blocks are set on vertical and horizontal rod assemblies which control the corresponding movements of the heads.

The full cycle—including feed selection and change, speed selection and change, head movements, turret indexes, coolant pump on and off, and all other necessary functions for machining—is thus automatically controlled.

Ram head on this machine will also be equipped with a GE electronic tracer, providing two-dimensional 360° tracing operation.

Elmes/King Division, American Steel Foundries, Cincinnati 29, Ohio—Booth 1406

MORE DATA? Circle 110, inside back cover

Pope Super-Precision Boring Machine Claimed Accurate Within Millionths

Model 16-9 boring machine is a horizontal-spindle unit with electrical feed and traverse and a table with 9-in. stroke. Automatic cycling can be set up with a timed loading period. Table and bridge are set at 45° for easy loading. A trough removes chips and coolant.

High-precision boring heads are incorporated; special heads may be added instead.

Feed ranges from ½ to 10 ipm on the table, with rapid traverse of 10 to 200 ipm.

Pope Machinery Corp, 261 River St, Haverhill, Mass—Booth 482

MORE DATA? Circle 111, inside back cover

Giddings & Lewis 8-ft Borer Features Antifriction-Bearing Table

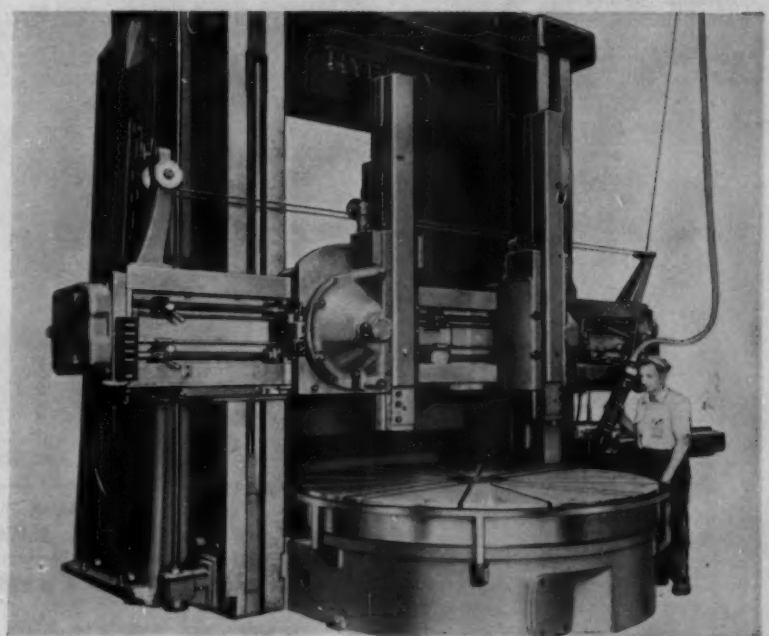
Roller bearings support the rotary table of the G & L 8-ft vertical boring mill, and a preloaded center bearing reduces heat buildup.

An electronic readout measuring system operates from the right-hand turret-head slide and saddle provides tool locations accurate to 0.001 in. Readout counters can be set to a reference point after tool is set.

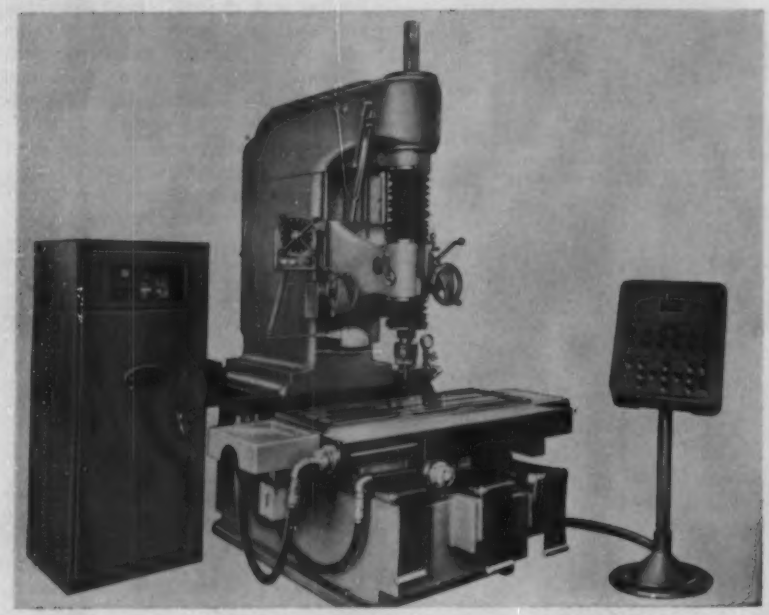
Pushbutton pendant controls all machine functions including table speed. The right-hand rail has a five-position turret, the rail head has a swiveling ram, the right-side head has a four-position indexing turret, and the table has a 96-in. diameter. Work capacity is 96 in. under the rail, swiveling head has 72 in. of travel, there is 42-in. travel for the turret head, and 36-in. travel beyond the saddle for the side head.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA, Circle 112, inside back cover



BORING—Machine Tool Exposition in Print



Knight Jig Borer, with Numerical Control, Is Accurate to Tenths

Model 65 features accuracy to tenths as well as high traversing speed. Table and saddle traverse simultaneously to reach each position in the shortest possible time. Positioning accuracy is obtained from ultra-precision linear transducers which cannot wear because location signals are given electrically with no physical contact.

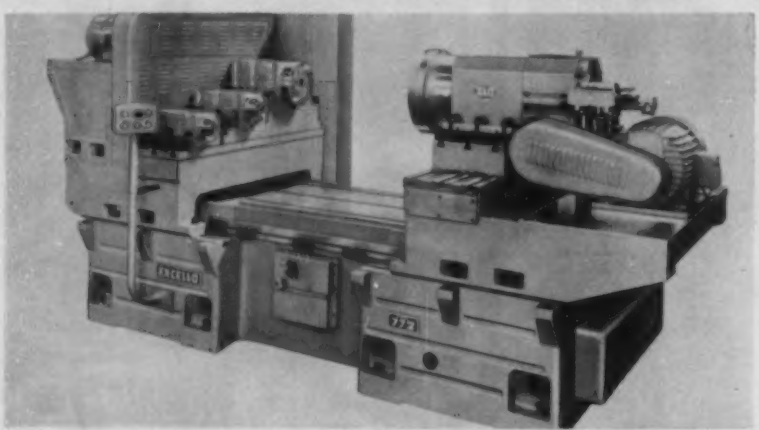
Table and saddle are driven by hydraulic cylinders, which operate from balanced, closed hydraulic circuits. These circuits provide automatic clamping, free of distortion.

The machine is equipped for both tape and manual dial input, with push buttons for the rapid traverse.

Specifications are table size, 18 x 52 in.; longitudinal movement, 28 in.; cross movement, 18 in.; vertical capacity, 27½ in.

W B Knight Machinery Co, 3920 W Pine Blvd, St Louis 8, Mo—Booth 824

MORE DATA? Circle 113, inside back cover



LARGEST STANDARD EX-CELL-O HORIZONTAL BORING MACHINE is model 772, a double-end machine with heavy-rib, nickel-cast-iron base, hydraulic power, heavy ribbed table, and two adjustable feeds in two directions. Standard spindle bridges, spindles, facing heads, motor bridges, and drives may be interchanged for various operations and different work. (AM—Oct 5 '59, p 128) —*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32*—Booth 946

MORE DATA? Circle 114, inside back cover

Jig Boring Machine by Atlantic Has Two Variable Speed Ranges

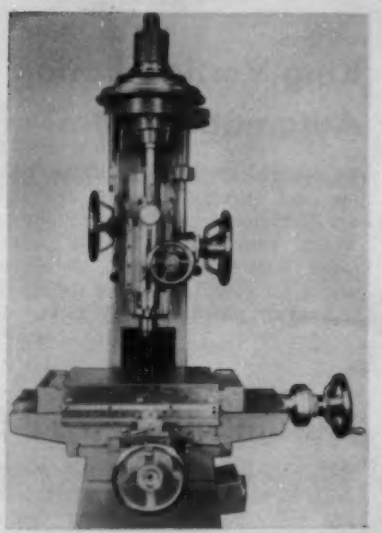
Model 5000 Atlantic jig borer is equipped for spindle speeds in two ranges, from 45 to 275 rpm, and from 275 to 1980 rpm. These are completely variable, controlled by dial. Six spindle feeds are available.

Table size is 12 x 22 in., with 12 in. traverse and 18 in. longitudinal motion. The quill housing will travel 12 in., and the spindle quill will move 4⅜ in. Spindle overhang from column is 14 in.

The machine weighs 4410 lb, and has heavy ribs, precision ways, and easily-read graduations on dials.

Atlantic Machine Tool Works, Inc, 549 Cedar St, Newington, Conn — Booth 543

MORE DATA? Circle 115, inside back cover



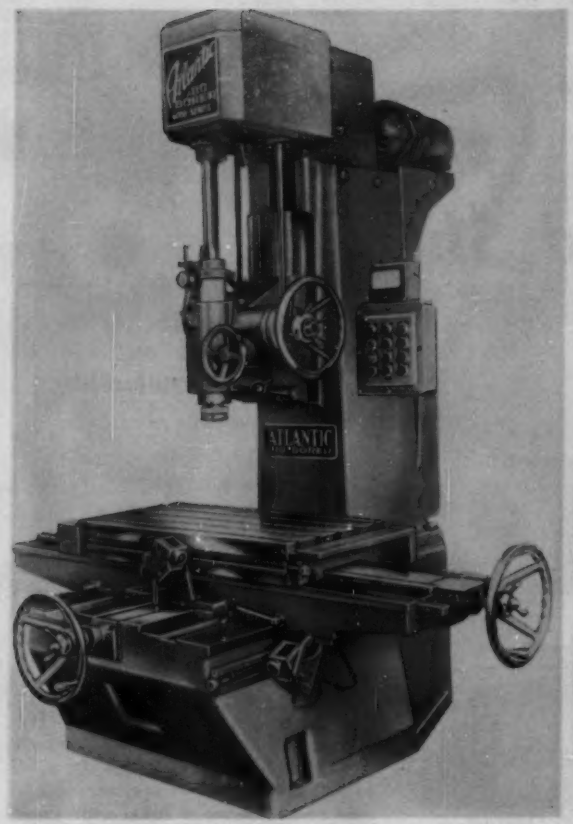
Atlantic Toolroom Jig Borer Positions Table Within 0.0002 in.

Model 4000 Atlantic jig boring machine has ten spindle speeds from 90 to 2350 rpm, and a table work surface of 12 x 18 in. Table travel is 16 in. longitudinally and 12 in. across. Spindle overhang from column is 9½ in. The spindle quill travels 4½ in., and the head travels 9 in.

The machine has scraped ways and guides on bed and carriage. Spindle is hard-chrome plated and honed, and preloaded precision bearings are installed. A binder lock holds the quill in any position for milling. Spindle feed is 0.004 ipr in either direction.

Atlantic Machine Tool Works, Inc, 549 Cedar St, Newington, Conn — Booth 543

MORE DATA? Circle 116, inside back cover



Atlantic Model 6000 Jig Borer Handles Large Jobs on 40-in. Table

Heavy jig-boring machine features 20 x 40-in. working surface on table and 35 x 18-in. table motions. Spindle speeds range infinitely from 30 to 250 rpm and from 270 to 1500 rpm. Feeds are 0.001, 0.003, and 0.006 ipr.

The 8000-lb machine takes 80 x 92-in. floor space. It features electric clutch, accuracy to 0.0002 in., and optical scale reading that includes depth accuracy to 0.0001 in.

Atlantic Machine Tool Works, 549 Cedar St, Newington, Conn—Booth 5437

MORE DATA? Circle 117, inside back cover

Ex-Cell-O Vertical Boring Unit Has Single or Double Spindles

Model 411 single-column precision boring machine is intended for precision turning, boring, facing, grooving, and chamfering on medium-size parts. The machine slide is counterbalanced and hydraulically operated.

Seven different arrangements are possible with basic components, including one or two work spindles, and left or right mount for spindle-drive motors. The machine features easy tool change and adjustment, and easier and safer loading.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32—Booth 946

MORE DATA? Circle 119, inside back cover

Cam-Controlled Ex-Cell-O Borers Have Fast Changeover, Retooling

Two different cam-operated precision horizontal boring machines, models 308 and 312 (photo), are cam-controlled for turning, boring, facing, grooving, and chamfering operations. Tooling area is accessible for fast setup change.

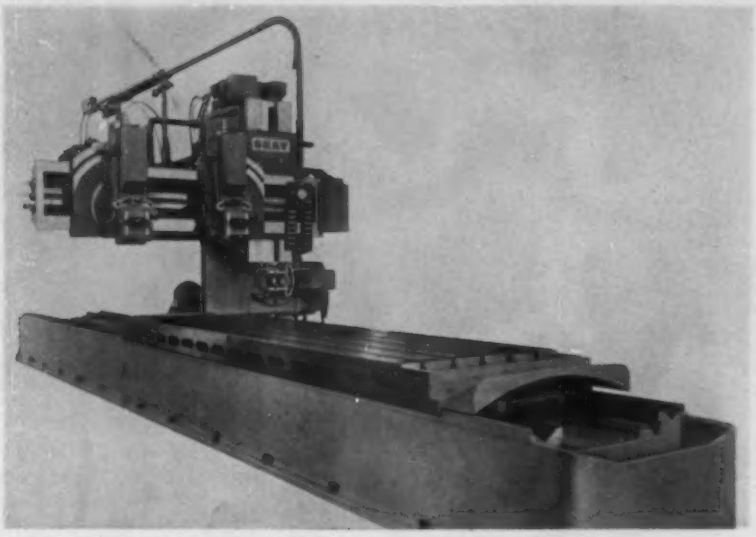
Cams for table and cross-slide control are mounted on a single shaft for accessibility—the shaft swings out of the machine base for cam change. Straight boring, turning, and other operations may be performed by locking the cross-slide. Power lubrication is featured to lubricate the ways during each machining cycle.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32—Booth 946

MORE DATA? Circle 118, inside back cover

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Planing and Shaping



EXHIBITORS DISPLAYING PLANING AND SHAPING EQUIPMENT

BOOTH	EXHIBITOR
1350	The G A Gray Co Cincinnati 7, Ohio
651	Norton Co Worcester 6, Mass
1001	Rockford Machine Tool Co Rockford, Ill

Gray Universal Planer Double-Cut Roughs And Finish-Planes Simultaneously

The new Gray Universal planer permits finish-planing at the same time the machine is double-cut roughing. This means that precision cuts can be made at high speed without a tool change.

Planer uses the same standard tools as other planers; the double-cutting tools are standard carbide tips held in simple holders. Lever control transforms machine from a conventional planer to a double-cutting, high-production planer. All controls are on the pendant, including table movement, feed selection, and selection of direction and rapid traverse.

Machine measures 48 in. x 14 ft, has table speeds adjustable up to 300 fpm, and weighs about 100,000 lb. Other features include nonmetallic table ways, space saver drive with floating drive shaft, safety stop and table replaced, square lock rail and column, and improved head design.

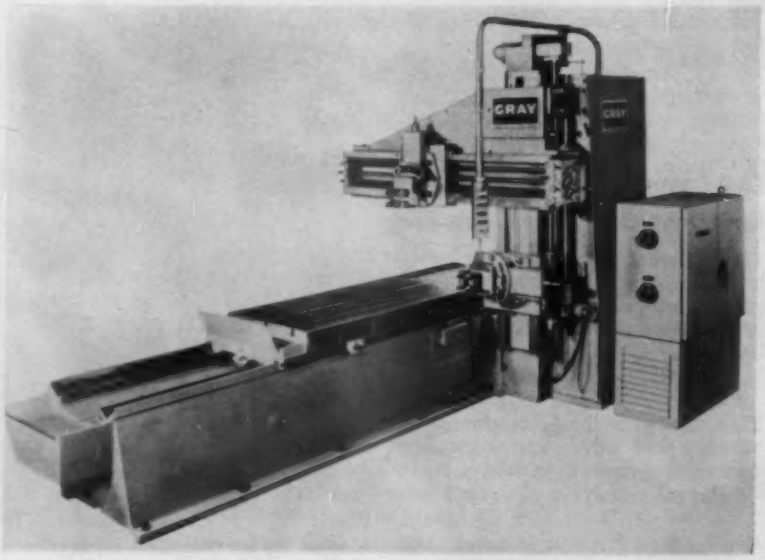
G A Gray Co, 3611 Woodburn Ave, Cincinnati 7, Ohio—Booth 1350

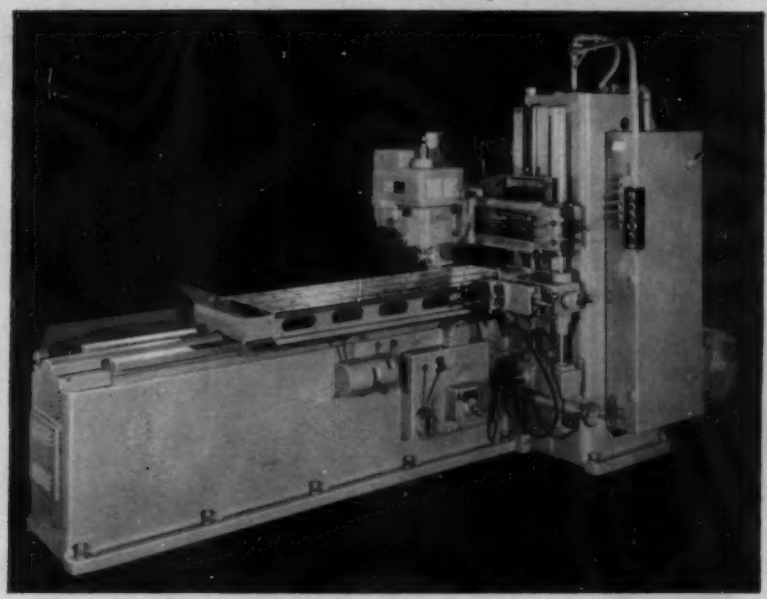
MORE DATA? Circle 120, inside back cover

NOTE:
A Smith & Mills shaper appears on page 290.

DOUBLE-CUTTING PLANER, the Flying Scot, is designed for fast carbide cutting. Table speeds range from 30 to 300 fpm. Machines are available in nine combinations of table widths and heights. Basic sizes are 30, 36, and 42 in. The 60, 75-hp drive motor is adjusted through rheostats, and produces 10,000-lb table thrust (*AM/MM—Apr 18 '60, p148*)—*G A Gray Co, 3611 Woodburn Ave, Cincinnati 7, Ohio*—Booth 1350

MORE DATA? Circle 121, inside back cover





Rockford 72-in. Hydraulic Openside Shaper is Equipped with Milling Head

This new 72-in. shaper, fully convertible for shaping or milling, is designed for small shops who need both a large capacity milling machine and a large capacity shaping machine, but whose production does not justify two separate machines. This openside shaper can also be provided with either a full form or rail templet duplicator head for shaping.

The shaper drive, a 15-hp hydraulic circuit, provides 200 fpm maximum cutting and return speeds. Table drive for milling is through a screw and double nut located on the outboard side of the machine. The nut bracket connected to the table for milling feed can be quickly removed when converting from milling to shaping.

Both the table and head milling feed screws are connected to a common gear box which is driven by a DC motor to provide infinitely variable feed rates of 1—100 ipm. The head has a 3-in. quill adjustment and the spindle has a No. 40 National Milling Machine Taper and manual draw bar. There are 8 spindle speeds provided in the range of 50—1200 rpm with speed changes accomplished by pick-off gears.

Rockford Machine Tool Co, Rockford, Ill—Booth 1001

MORE DATA? Circle 122, inside back cover

Norton-G & E Shaping Machine Has Hydraulic Contour Tracer

The 16-in. high-speed and 24-in.-stroke shapers produced by Gould & Eberhardt do automatic contour shaping controlled by a hydraulic follower attachment. The machine is rigid for heavy cuts, and has enclosed motor drive, ram, and feed drives for safety and cleanliness.

Switch control eliminates the usual clutch. Electric brakes are installed, and transmission gears are induction hardened.

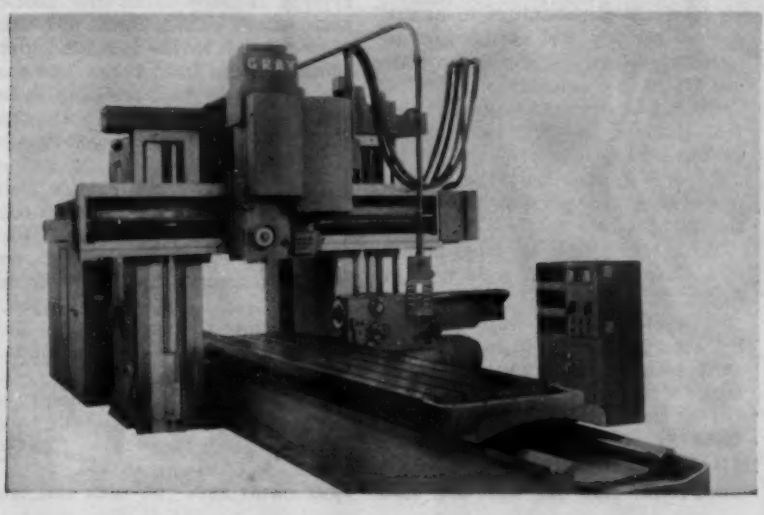
Sixteen ram speeds are selected by dial. V-ways are hard-chromed.

Norton Co, Worcester 6, Mass—Booth 651

MORE DATA? Circle 123, inside back cover

Gray Planer-Miller Has Spindle Speeds To 500 rpm, Power Rail Leveling

Planer-miller features lever-controlled spindle speeds up to 500 rpm. It measures 48 in. x 16 ft, has a 10-in. quill, 50-hp non-swiveling rail head, and a 5-in.-dia, 30-in.-travel-bar side head. Housings, columns, and rails have square lock design to absorb heavy cutting thrusts in both feeding directions.



The new Match-Maker attachment utilizes simple dial control for making perfect spindle adjustments. Spindle tram adjusts in seconds, and spindle alignment may be adjusted as readily as spindle speeds.

Milling heads are available with Micro-Meter, a device for accurately registering quill position. By pushing a button, the operator can read immediately an indicator that shows him if the rail is level, or to what degree out of level.

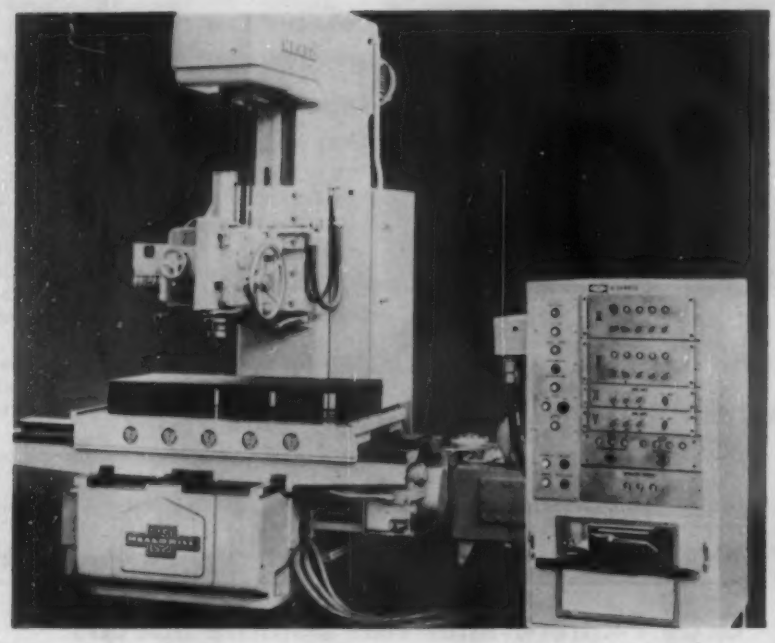
Automatic indexing for locking table, rail, and side heads can be furnished for repetitive work where high accuracy is required. Machine is available with Phase I of the Gray Space Setter numerical control (*AM/MM*—Mar 21 '60, p165).

G A Gray Co, 3611 Woodburn Ave, Cincinnati 7, Ohio—Booth 1350

MORE DATA? Circle 124, inside back cover

MMT-PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

Drilling



Numerically Controlled Healdrill Gives Direct Programming of All Functions

A new Heald drilling machine, equipped with Cincinnati Milling's "Acramatic" analog-type two-axis tape positioning control, allows direct and fully automatic programming of all machining functions: table positioning, speeds, feed rates, and tool changes. This heavy-duty machine is accurate to ± 0.001 in. and offers part-to-part dimensional uniformity with repeatability of ± 0.0002 in.

An advantage of this single-spindle vertical drill is its spindle depth control feature. With it, limit switches, which are attached to six rotary scales, are actuated through a manual selector to predetermine tool downfeed position. Another feature is an automatic "Z" axis (or quill) cycle which permits the machine to operate unattended while drilling a pattern of holes having the same diameter.

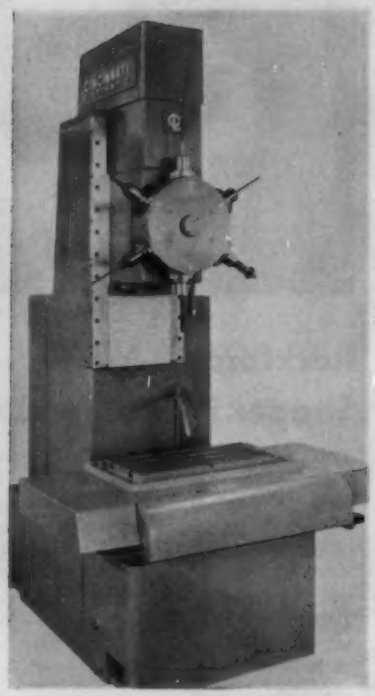
The Acramatic control system also enables complete program shift (zero shift) in two axes over a 20 x 48-in. area. For single piece and experimental parts production, however, the Healdrill can be shifted to manual control quickly and easily. Coordinates, feeds, speeds, and depth stops are dialed in manually.

Other features are: single light for tool change; 30—1800 rpm spindle speed range in 16 increments; 0.002—0.030 ipr spindle feed range in 8 increments; 230 ipm max table positioning speed.

Table travel is 48 in. longitudinal, 20 in. transverse, over a 24 x 56 in. table; vertical range, top of table to spindle nose, is 30 in. Table positioning accuracy is ± 0.001 in., and zero shift is applicable over full work area.

The Heald Machine Co, 13 New Bond St, Worcester 6, Mass—Booth 924

MORE DATA? Circle 125, inside back cover



Cintimatic Turret Drillpress Has Automatic Tape Control

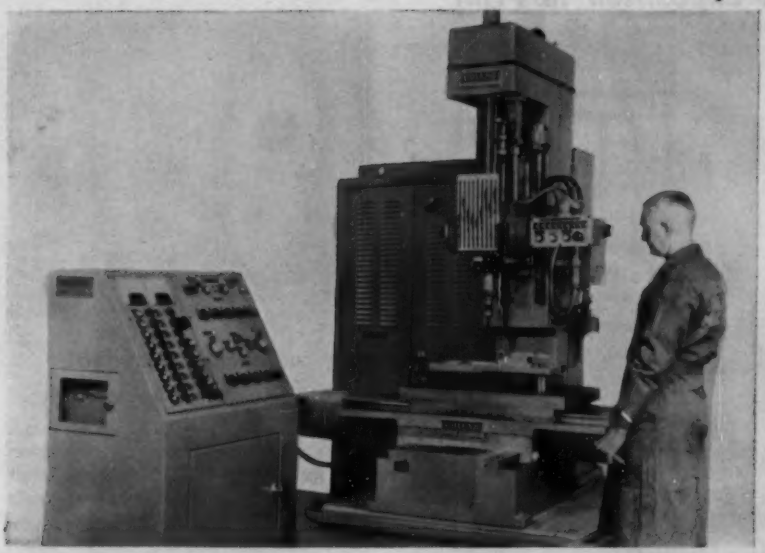
Six tools are manually or tape controlled to specified hole depth, with reverse if desired, on the Cincinnati turret drill. Some 100 feed rates from 0 to 100 ipm, and eight spindle speeds from 190 to 3000 rpm are standard. In a drilling cycle, the tool rapid advances, then stops to slow feed at 0.060 in. above the work.

The machine has a 12½ x 25-in. work table that can be positioned automatically over an area of 10 x 20 in. Turret "zero shift" is employed to compensate for variations in work height and tool length without affecting the control tape. This is followed automatically by the machine for all six tools.

The motor is 5 hp, and capacity is 1½-in. drilling in mild steel.

Cincinnati Lathe & Tool Co, Cincinnati 9, Ohio—Booth 934

MORE DATA? Circle 126, inside back cover



Edlund-Matic Layout Drilling Machine Has Numerical Control Tape and Dial Input

The Edlund-Matic is a numerically controlled drilling and tapping machine employing a new concept to perform economically all multiple operations required on single-piece layout work or short-run production requirements.

The operator can set up nine different operations at one time. He dials in the feeds, speeds, rapid traverse, and depth of feed for each operation, then places a previously prepared tape in the numerical tape reader. The tape controls the positioning of the table beneath the spindle.

At the machine setup control panel, the setup man or operator moves a manual operation selector knob to No. 1 position. He sets the correct feed and speed, watching each instrument dial to confirm the setting. He then continues to do the same for each of the nine possible different operations.

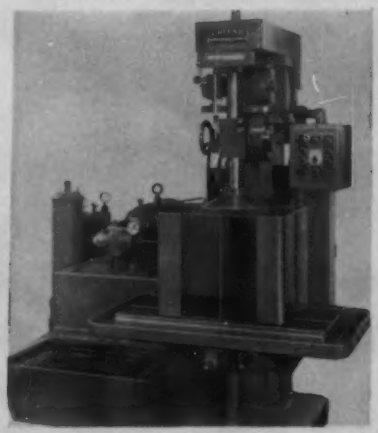
After making these settings, the operator turns back to switch position No. 1 and proceeds to set the rapid traverse and depth of feed stops for that particular operation.

Machine has a capacity of 1 in. in cast iron, ⅞ in. in mild steel. Spindle travel is 7 in. and sliding arm travel is 10 in. Other specifications include infinitely adjustable spindle speeds from 225—2700 rpm, infinitely adjustable spindle feeds from 1—7 ipm, absolute table accuracy of 0.001 in., repeatability of 0.0002 in.

The compound table has a travel of 14 in. x 30 in., and is 36 in. above the floor. Distance from toolholder to compound table is 5¾ in. minimum, 22¾ in. maximum.

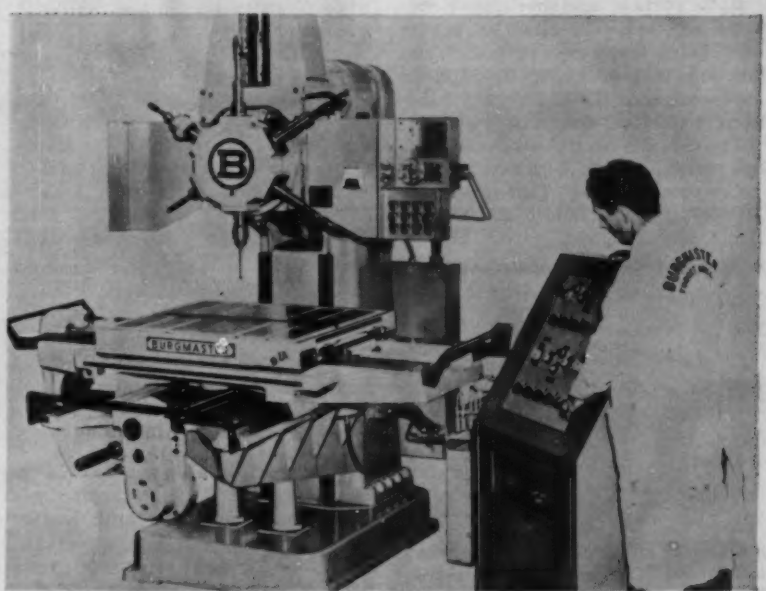
Edlund Machinery Co, Cortland, NY—Booth 531

MORE DATA? Circle 127, inside back cover



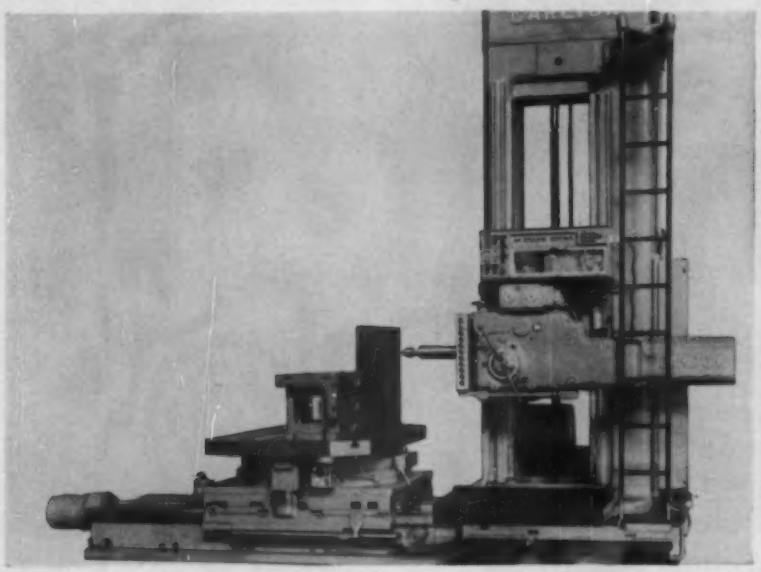
GUN DRILLING MACHINE, Model 2G, often eliminates reaming because hole finish of 4 to 8 microinches can be obtained and size held within a few thousandths of an inch. Machine is equipped with company's Model 2HPC high-pressure coolant system—*Edlund Machinery Co, Cortland, NY*—Booth 531

MORE DATA? Circle 128, inside back cover



TWO NEW MODEL NUMERICALLY CONTROLLED machines are being shown by Burgmaster. New model 6-spindle turret drill (shown) introduces an intermediate size machine with 3-axis tape control; a tape controlled double housing planer type 8-spindle turret drill with 48 x 60 in. positioning table greatly extends capacity of this line—*Burg Tool Mfg Co, Inc, 15001 S Figueroa St, Gardena, Cal*—Booth 834

MORE DATA? Circle 129, inside back cover



Carlton Horizontal Drilling, Boring Machine Has Tape Control System

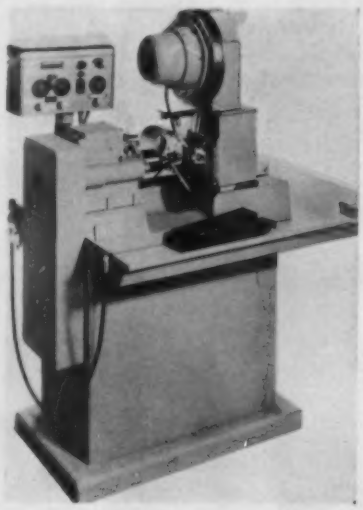
This horizontal drilling and boring machine has a working area of 72 in. vertical by 96 in. horizontal. The 36 spindle speeds and 18 power feeds are controlled by preselector, either manually or by tape. In and out travel of the spindle is 30 in.

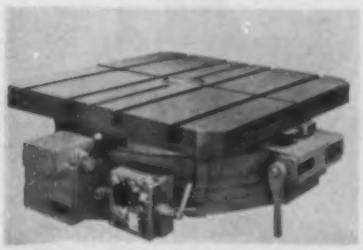
Both vertical and horizontal motions are tape controlled by a system which features 5 or 6 digit input information either by tape or keyboard, zero offset, auxiliary functions, numerical data display.

The spindle is powered by a 15 hp motor.

Carlton Machine Tool Co, 2961 Meeker St, Cincinnati 25, Ohio—Booth 849

MORE DATA? Circle 130, inside back cover





INDEXING TABLE handles extra-heavy loads, even if loads are off-center. This 50-in.-square Airmist table floats on an air-oil mist layer about 0.001 in. thick when indexing (AM/MM—Jul 11 '60, p164)—*Cincinnati-Gilbert Machine Tool Co, 3366 Beekman St, Cincinnati 23, Ohio*—Booth 1326

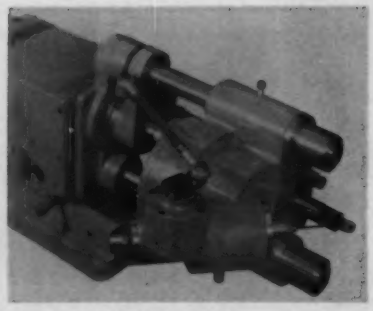
MORE DATA? Circle 131, inside back cover

Snow Horizontal Machine Does Drilling, Tapping, Threading

A new horizontal machine, No 1-HD, which does drilling, tapping, and threading, is available with hopper feed for long run operations and hand feed for short runs; 6000 cycles per hour can be obtained. Its drilling capacity is from No. 60—⅜ in., and its tapping capacity is from No. 0—½ in.

Snow Mfg Co, 435 Eastern Ave, Bellwood, Ill—Booth 247

MORE DATA? Circle 132, inside back cover



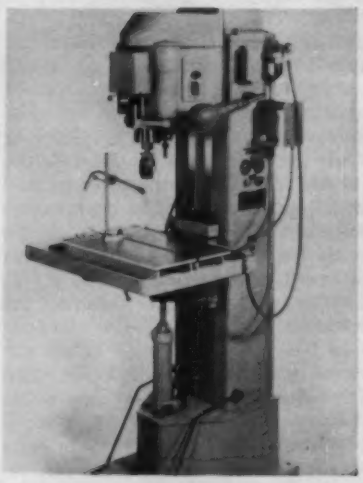
Kingsbury Angular Feed Drill Head Allows Fixed Angle Work

Kingsbury angular feed drill head, which makes possible an operation at a fixed angle, is driven by a model 16 drilling unit. Using the same basic design as a standard, the company designs and builds a special head for each application.

The quill feeds the head forward until it hits a stop. The head shown has an angular drill bushing that feeds forward into a large hole. As the quill continues to feed forward, it causes the tool, through a linkage, to feed forward in the bushing.

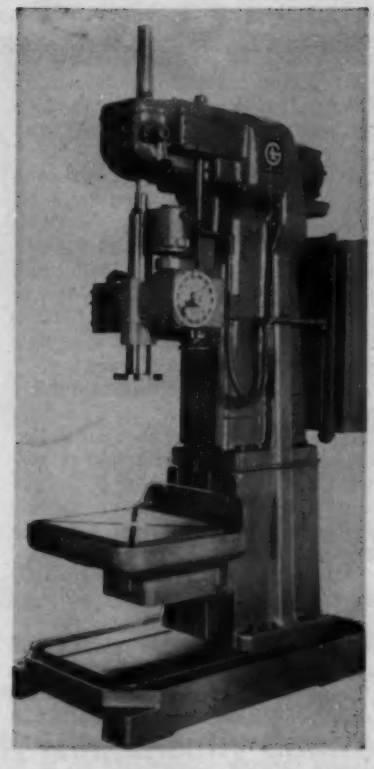
Kingsbury Machine Tool Corp, Keene, NH—Booth 731

MORE DATA? Circle 133, inside back cover



VERTICAL UNIVERSAL DRILLING machine has infinite hydraulic feed control in conjunction with air feed. This machine has a drilling capacity of 3/16—⅝ in. in alloy steel. (AM/MM—Mar 2 '60, p139)—*Snow Mfg Co, 435 Eastern Ave, Bellwood, Ill*—Booth 247

MORE DATA? Circle 134, inside back cover



G & L Bickford Upright Drill Cycles Spindle Automatically

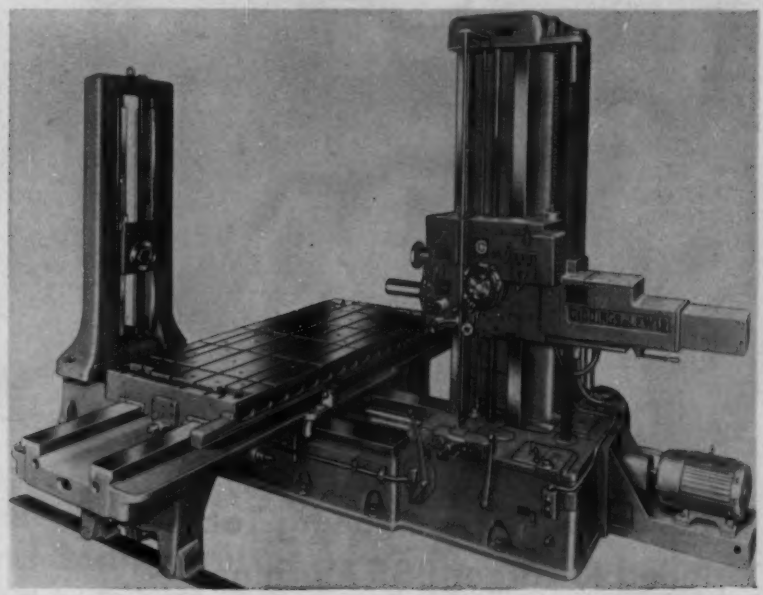
Upright drill with automatic single-cycle spindle control is available arranged for automatic drilling and tapping or drilling only, and has a head-mounted control center for cycle start, spindle start, spindle jog, drill, tap, dwell, coolant control, emergency return, and motor stop.

Limit settings that control spindle travel are set up on a dial selector mounted on the head. For counterboring and spotfacing, a cycle dwell unit works with a fine-feed wheel.

The 28-in. drill has a wide range of feeds and speeds, suitable for small-lot or production runs.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA? CIRCLE 135, inside back cover



G & L 4-in. Horizontal Boring, Drilling, Milling Machine Has Zero Positioner

A simplified horizontal boring, drilling, and milling machine made by Giddings & Lewis includes a reference offset scale, which combines index numbers with standard scales and verniers so the operator can establish zero at any point of head or table travel

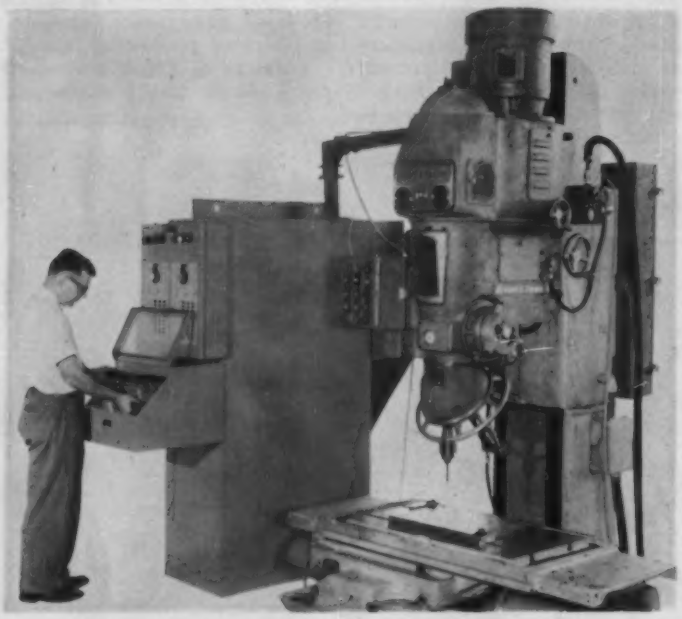
The machine has a 48x48-in. table, 60 in. of vertical travel, 30 in. of longitudinal travel, and 72 in. of cross travel. There are 45 speeds ranging from 10 to 1300 rpm, and 18 independent spindle feeds in each of two speed ranges.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA? Circle 136, inside back cover

EXHIBITORS SHOWING DRILLING EQUIPMENT

BOOTH	EXHIBITOR
381	American Tool Works Co Cincinnati 20, Ohio
641	John S Barnes Corp Rockford, Ill
152	Barnes Drill Co Rockford, Ill
452	Brown & Sharpe Mfg Co Providence, R I
551	Buffalo-Forge Co Buffalo 5, N Y
834	Burg Tool Mfg Co Inc Gardena, Calif
849	The Carlton Machine Tool Co Cincinnati 25, Ohio
1326	The Cincinnati Gilbert Machine Tool Co Cincinnati 23, Ohio
934	Cincinnati Lathe & Tool Co Cincinnati 9, Ohio
531	Edlund Machinery Company, Div of Bradley-Edlund Corp Cortland, N Y
846	Ekstrom, Carlson & Co Rockford, Ill
946	Ex-Cell-O Corporation Detroit 32, Michigan
800	Fosdick Machine Tool Company Cincinnati 23, Ohio
1320	Giddings & Lewis Machine Tool Company Fond du Lac, Wisconsin
486	The Hamilton Tool Co Hamilton, Ohio
924	The Heald Machine Co Worcester 6, Mass
347	The Kempsmith Machine Co Milwaukee 14, Wis
731	Kingsbury Machine Tool Corp Keene, N H
631	Leland-Gifford Co Worcester 1, Mass
1445	Morris Machine Tool Co Cincinnati 2, Ohio
822	The Motch & Merryweather Machinery Co Cleveland 8, Ohio
1205	National Automatic Tool Co, Inc Richmond, Ind
231	Seneca Falls Machine Co Seneca Falls, N Y
341	Sibley Machine & Foundry South Bend 23, Ind
247	Snow Manufacturing Co Bellwood, Ill



Tape-Controlled Positioning Table Applied to Larger B&S Machine

Automatic hole production in large workpieces is the function of the Model B automatic turret drilling machine. Table travel is 15 x 20 in.; table working surface, 20 x 31 in. Maximum distance from spindle to table top is 24¼ in.; head travel is 12 in. Machine will tap 1 in.—8 pitch threads.

The table has a ball-bearing lead-screw and nut for both axes; moves from position to position at 200 ipm max; electrical position accuracy is 0.001 in. and repeat to ±0.0005.

Any of the six spindles in the turret head will tap. No tapping head is required.

Turret indexing can be automatic or manual. Spindle speed range is infinitely variable between 125-2000 rpm. An infinitely variable mechanical feed by Reeves drive gives feeds from 0.0025 to 0.021 ipr. Power take-off from the main drive by timing belt always relates the feed properly to the spindle rpm.

Accurate depth setting is quickly effected by stop nuts. A Ceda-Seat device operates by the controlled elastic-deformation principle to control depth and provide a definite stop to dwell and clean up a counterbored hole. Singlepoint boring can also be done.

Power features can be disconnected to operate the machine by hand if desired—as for setup.

The model B turret drilling machine is available with the GE Mark II tape control system; however, other tape systems can be applied. A larger base machine is available with tables ranging in capacity up to 25 x 48-in. table travel.

Brown & Sharpe Mfg Co, Providence, R I—Booth 452

MORE DATA? Circle 137, inside back cover

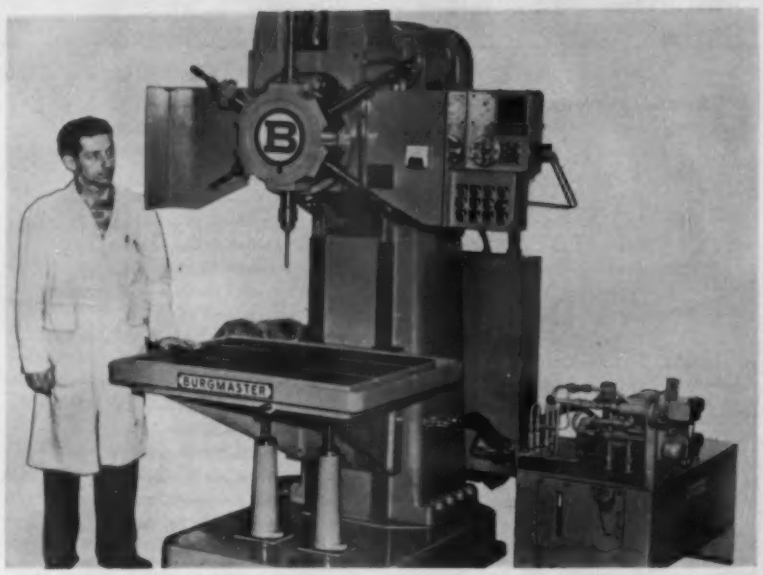
New Model Heavy Duty Burgmaster Machine Drills 1¼-in. Steel

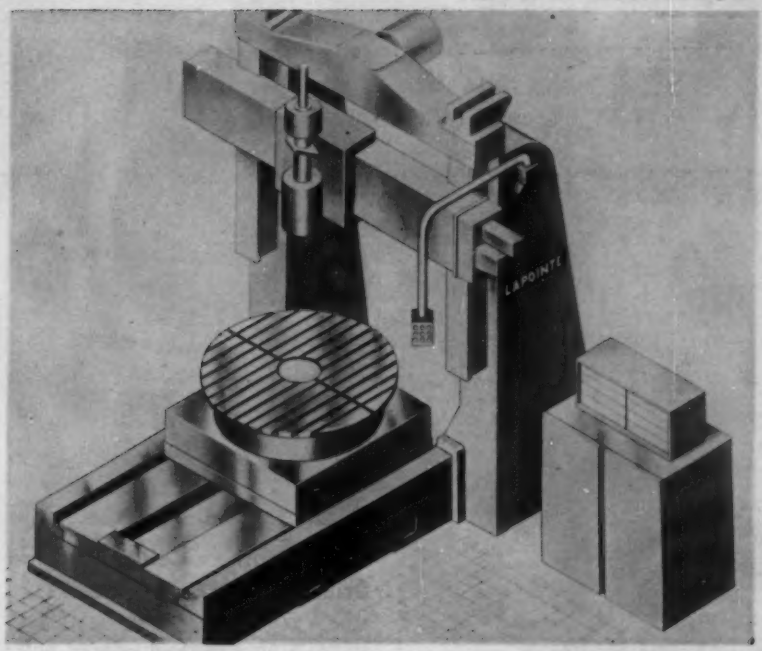
Model 25 AH (Automatic Hydraulic) Burgmaster 6-spindle turret drilling machine, driven with a 7½ hp motor, has 1¼-in. capacity in steel and a speed range of 90-3000 rpm. Throat depth is 17 3/16 in. and turret travel is 10 in.

The turret power indexes, including skip indexing past idle spindles, with an accuracy of 0.0005 in., one spindle to another. Other new features are: constant-positive hydraulic feed with dial set; direct reading electrical feed indicator; automatic temperature and pressure compensation of hydraulic feed; turret clamp employs V-type automatic clamping ring; quick-set depth stops and rapid traverse stops permit very fast setup and quick changeover for short run production.

Burg Tool Mfg Co, 15001 S Figueroa St, Gardena, Cal—Booth 834

MORE DATA? Circle 138, inside back cover





Rotary-Table Drilling and Boring Unit Is Numerically Controlled in Two Axes

48/48 AUHP drilling and boring machine has a 48-in. rotary table with a 60-in. top, and has capacity for 48-in. work height from table top to spindle nose. It has a double column, power-operated crossrail, and table indexing accurate within six seconds of arc.

Several control methods are optional. The machine is fully automatic with two-axis punched-tape numerical control, which commands the rotary position of the table and lateral position of the spindle on the crossrail. The same information can be dialed into the machine for manual-numerical control. Electromechanical controls will operate the machine automatically, and it can be semi-automatically controlled with pushbuttons.

The machine does precision drilling, reaming, and boring in any hole patterns up to the full table size. Drilling capacity is ¾ in. diameter in 1-in. stainless. Tooling can be fitted for scalloping and rotary, end, or face milling.

This machine is completely integrated and safety interlocked to prevent accidents.

Lapointe Machine Tool Co, Hudson, Mass—Booth 1229

MORE DATA? Circle 139, inside back cover

Openside Boring, Drilling Machine Is Numerically Controlled

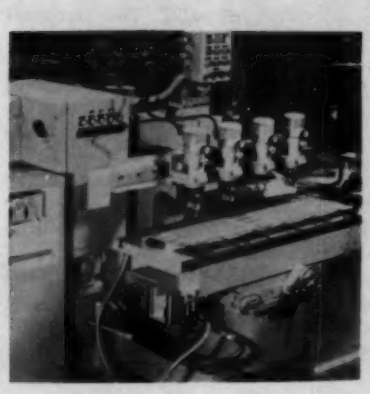
This openside boring and drilling machine has a 19-in. column and is equipped with a precision boring-mill-type spindle. There are 32 spindle speeds from 20—1600 rpm, and 16 feeds from 0.003—0.125 ipm. Both the feeds and speeds are pre-selective.

The General Electric 8-channel punched-tape control system provides 80 in. drillhead travel on the horizontal arm (Y-axis) and 180 in. of saddle travel on the bed (X-axis). Positioning speed for both axes is 100 ipm. The control system includes a full shift zero-shift feature.

Movement on the X and Y axes may be tape controlled or controlled manually through pushbuttons. Capacity of the machines allows working tremendous size pieces or setting up of individual stations for small work. With the latter technique, operations can be performed at one station while another station is being set up.

American Tool Works Co. Pearl St at Eggleston Ave, Cincinnati 2, Ohio—Booth 381

MORE DATA? Circle 141, inside back cover



J&L Tape-Controlled Table Speeds Drilling Operation

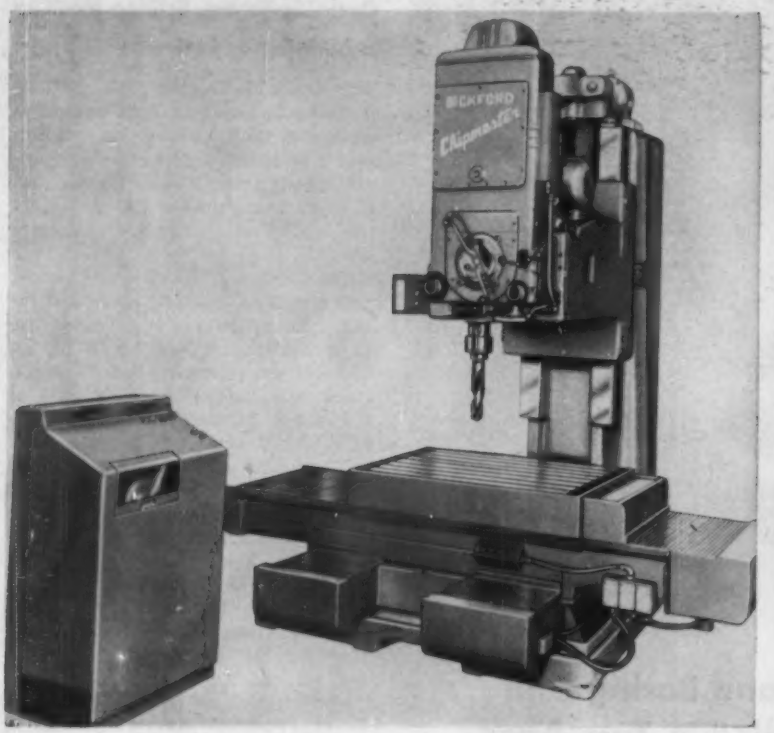
This 20x20-in. automatic positioning table is controlled by standard 1-in., 8-channel punched tape, and is equipped with electronic-hydraulic servo control for end point positioning. Table is shown in conjunction with a multiple-head setup for drilling printed circuit boards. Table is suitable for production.

Jones & Lamson Machine Co, Springfield, Vt—Booth 839

MORE DATA? Circle 140, inside back cover

SENSITIVE DRILLING MACHINE, the Maximus, is equipped with a toolroom base and a compound table. Company will introduce several other sensitive precision drilling machines—*Hamilton Tool Co, Hamilton, Ohio*—Booth 486

MORE DATA? Circle 142, inside back cover



Tape Controls Positioning Drill Machine That Repeats to 0.0005 in. at 360 ipm

High-speed Giddings & Lewis drilling machine operates with "Numeripoint"—controlled positioning table (*AM*—July 13 '59, p147). The drill has automatic hydraulic gear shifting and full preselection of 36 speeds and 18 feeds. With the positioning table, it is said to reduce floor-to-floor time as much as 75%.

Workpieces up to 5 tons can be handled on the table, to positioning accuracy of 0.001 in., repeating to 0.0005 in. Table surface is 38 x 50 in., and travel is 32 in. by 44 in. Table heights is 26½ in.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

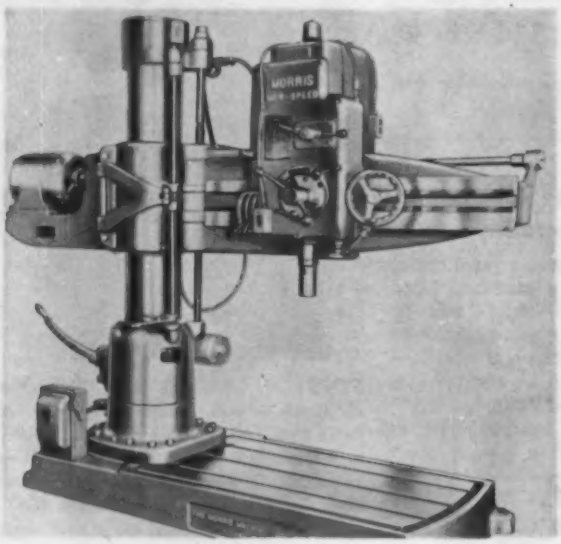
MORE DATA? Circle 143, inside back cover

Electrospark Ex-Cell-O Machine Drills, Pierces, Sinks Holes

Model 244 vertical Electrospark machine is an electric-discharge hole-cutting machine that will drill, pierce, trepan, or sink cavities in hard materials such as carbide. High-amperage current passes from the tool, made of relatively soft metal, to the work. Pulse frequency is 40,000 cps. Work is formed to an inverse image of the tool, with little tool wear. Work and tool must both be submerged in a dielectric fluid.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32—Booth 946

MORE DATA? Circle 144, inside back cover



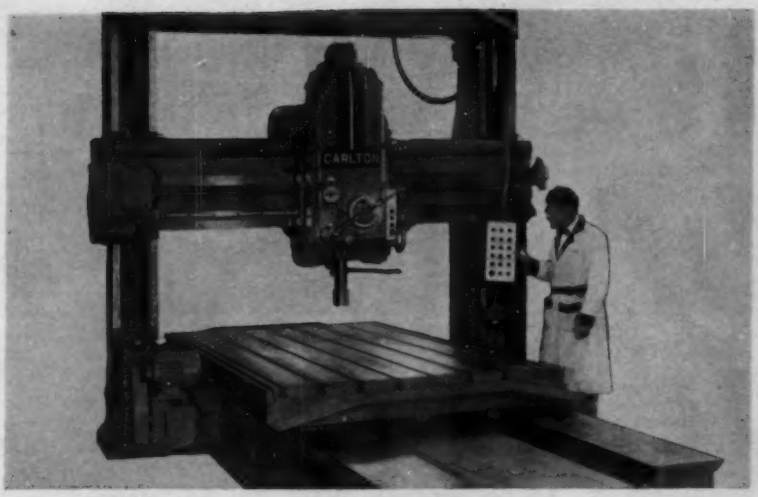
Redesigned Morris Radial Drills Feature Improved Lighting, New Lubrication System

The Morris Mor-Speed radial drills have been redesigned both internally and externally. The external electrical conduit is eliminated; column clamp and unclamp buttons are flush-mounted as is a 110-v electrical outlet. An improved lighting system assures complete illumination of the workpiece. A positive-displacement lubrication system provides more complete lubrication.

Machines are available in 9-in.-column heavy-duty sizes with 3 and 4-ft arms, in 11-in.-column heavy-duty sizes with 3, 4, 5, and 6-ft arms, and in 9-in.-column light sizes with 3 and 4-ft arms.

Morris Machine Tool Co, 2011 Eastern Ave, Cincinnati 2, Ohio—Booth 1445

MORE DATA? Circle 145, inside back cover



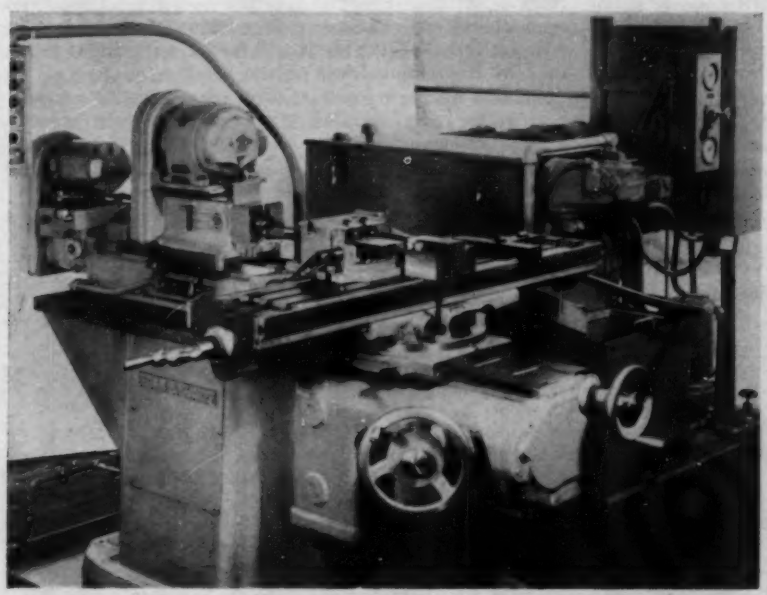
Carlton Tape Controlled Machine Drills and Bores in Vertical Plane

New model tape controlled machine, which drills and bores in the vertical plane, features a planer type table with double housings and bridge to support the cross rail. The tape system, manufactured by Carlton Controls Corp, directs table movement longitudinally and head motion transversely. The speed and feed preselector is also controlled by tape.

Other features: table working area, 66 x 96 in., with 25,000 lb capacity; maximum distance between table and spindle, 50 in., with 38 in. vertical adjustment to rail; 36 spindle speeds; 18 power; feeds spindle powered with 15 hp motor.

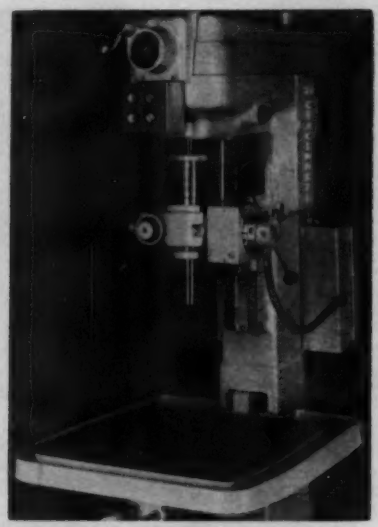
Carlton Machine Tool Co, 2961 Meeker St, Cincinnati 25, Ohio—Booth 849

MORE DATA? Circle 146, inside back cover



DEEP HOLE DRILLING MACHINE combines a gun drill unit with a knee-saddle-table assembly of a standard milling machine to provide increased workholding flexibility for short run operations without sacrificing machine rigidity. (AM/MM — Mar 7 '60, p135)—*Brown & Sharpe Mfg Co, Providence 1, RI*—Booth 452

MORE DATA? Circle 147, inside back cover



Cincinnati Sliding-Head Drill Has Numerical Table Control

Two numerically controlled drill-presses, a 24-in. unit and a 25-in. heavy-duty machine, are equipped for control of 12½ x 25-in. tables with Acramatic control system.

Cincinnati Infispeed variable-speed drive is available on the 25-in. machine for pushbutton control of spindle speed change. Normal ranges for the machines are 450 to 3000 rpm for the spindle of the 24-in. machine and 60-1825 rpm for the larger unit.

Cincinnati Lathe & Tool Co, Cincinnati 9, Ohio—Booth 934

MORE DATA? Circle 148, inside back cover

Leland-Gifford Introduces Six Drills; Two Are Tape Controlled

Two new tape-controlled drilling machines, two new gun drilling units, and two new standard multiple-spindle drilling machines are to be introduced at the Show.

A tape-controlled Hole Locator is designed for drilling electronic circuit boards.

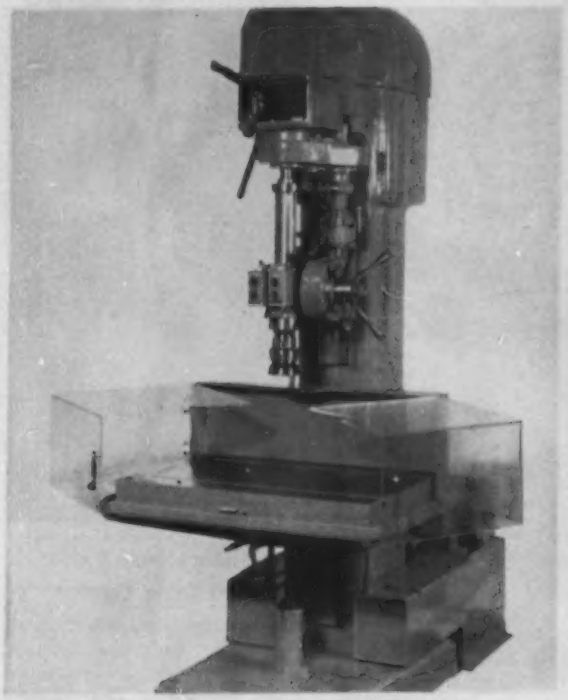
Also to be shown is a general-purpose tape-controlled Hole Locator with automatic table positioning capable of locating and drilling precision holes.

An 8-in.-stoke, hydraulic feed, horizontal gun drill is column-mounted to facilitate work positioning and to simplify fixturing.

The leadscrew feed of the new 24-in. gun drill is synchronized to and governed by the spindle speed.

Leland-Gifford Co, Worcester 1, Mass—Booth 631

MORE DATA? Circle 149, inside back cover



New Buffalo Hollow Spindle RPMster, with Improved Speeds, Feeds, Drills Exotic Metals

This new spindle drilling machine has a high pressure coolant system, higher spindle speeds, and special feed speeds for advanced drilling bits. Therefore, it can handle the super-hard exotic metals and cermets.

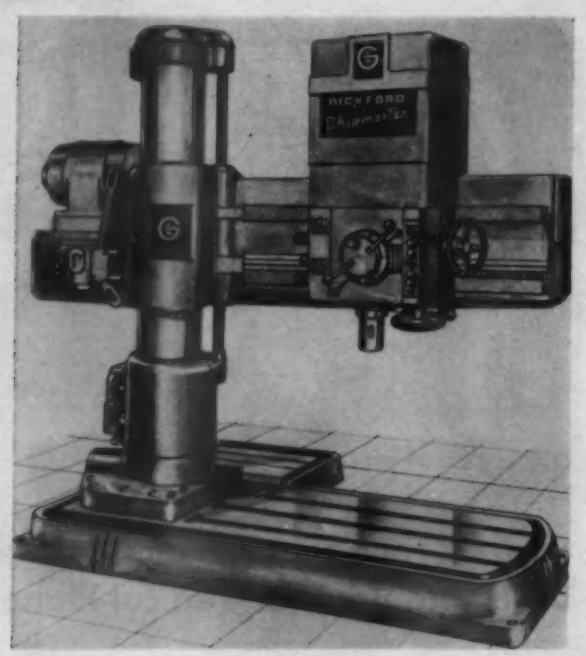
In actual production runs, increased productivity of over 300% has been realized in drilling titanium, Stellite, Rene 41, and stainless.

A principal feature of the machine is a timing belt, which eliminates belt slippage and "take-up." The variable speed range is 500—2000 rpm, nearly double that of previous models.

New special Buffalo drilling machines available with hollow spindle include three sizes in this variable speed RPMster, as well as No. 18 and 22 drilling machines.

Buffalo Forge Co, Dept 4, 490 Broadway, Buffalo 5, NY —Booth 551

MORE DATA? Circle 150, inside back cover



G & L Bickford Chipmaster Radial Features Fast, Quiet, Smooth Action

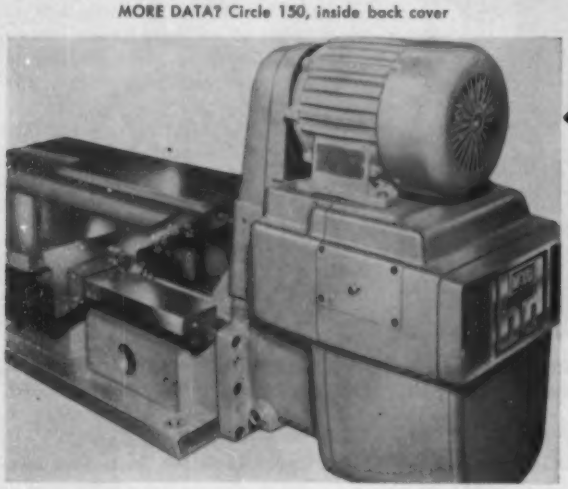
Chipmaster radial drill with 11-in. column has 10 hp and handles drilling up to a tool diameter of 2½ in. Power and controls are mechanized for automatic action. Rugged construction permits heavy cuts to close tolerances.

The machine has automatic tapping reverse at preset depth, automatic drill dwell, pushbutton spindle-feed control, spindle-reversing clutches in the head for easy accessibility, mechanical gear shifting with hydraulic gear locking, and 12 speeds and feeds (with direct reading) by convenient lever on the head.

Column has tapered roller bearings, preloaded, top and bottom for arm support. Hydraulic arm and column clamps are standard. Arm is box-shaped and has three sections for rigidity. All feed and speed gears are shaved and flame-hardened, and speed gears are honed.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis —Booth 1320

MORE DATA? Circle 151, inside back cover



High-Thrust Barnes Mechanical Unit Acts as Modular Machining Head

A drilling head that will operate vertically or horizontally, and has 30,000 lb of thrust, can be installed on transfer machines and multiple-head setups for drilling and similar jobs.

The mechanical unit has a planetary all-spur-gear drive with no right-angle driving, and with a full set of pickoff gearing for variable feed rates. Power to the spindle may be selected up to 30 hp; feed drive is by 2-hp motor. The unit mounts on ways 18 in. or more wide.

Barnes Drill Co, Chestnut St, Rockford, Ill—Booth 152

MORE DATA? Circle 152, inside back cover

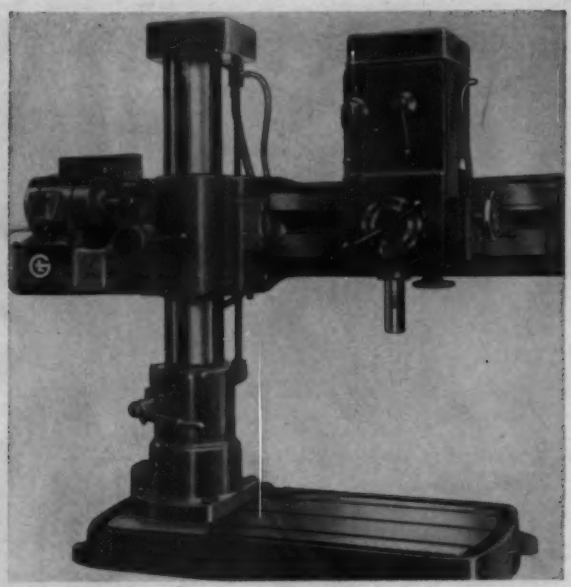
Two "Chipmaster" Bickford Radial Drills Feature Full or Partial Speed Preselection

Both speeds and feeds can be partly or fully preselected on 15-in. and 19-in. Giddings & Lewis Bickford radial drills. There are 36 speeds and 18 feeds, and the machines are available with 4-, 5-, or 6-ft arms (for 15-in. unit) or 6-, 7-, or 8-ft arms for the larger machine. All controls for speeds, feeds, power traverse, arm and column clamping, and power arm elevation are centralized in the head.

At the Show, the 15-in. column "Chipmaster" radial will be demonstrated under power, drilling holes and tapping Class 3 threads. The machine will feature manual selection of speeds and feeds. Elcetric column clamping by pushbutton is available.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis —Booth 1320

MORE DATA? Circle 153, inside back cover



G & L 9-in. "Chipmaster" Radial Has Automatic Tapping Reverse

Radial drill is equipped for electric spindle reverse when tapping, after tap depth is preset by pushbutton in head. All machine functions are powered by 5-hp arm-mounted reversing motor.

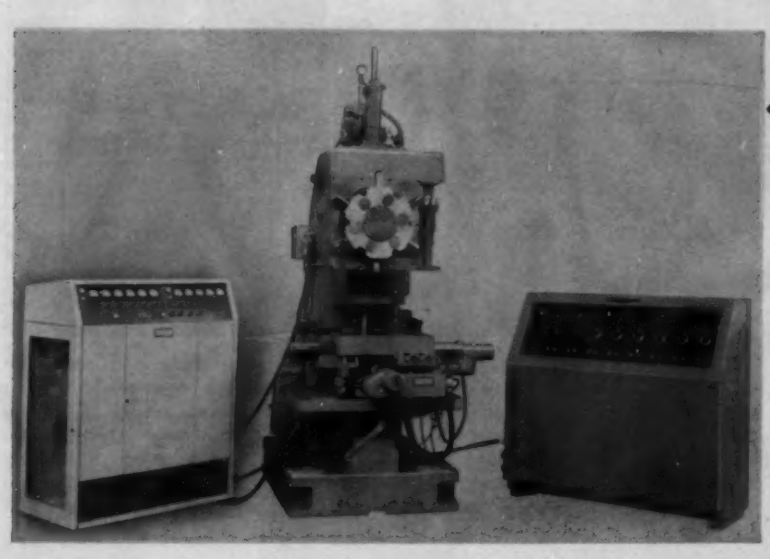
Spindle drive is direct, bypassing reversing clutch. Column is short, and arm has a triple box section for rigidity. Alloy spindle is carried in preloaded bearings.

Simplified controls, all on the head, include single-lever speed control and single-lever raising, lowering, and arm clamping.

Arm is either 3 or 4-ft, and has four spindle-speed ranges from 60 to 3500 rpm and four power-feed rates in two ranges from 0.002 to 0.020 ipr.

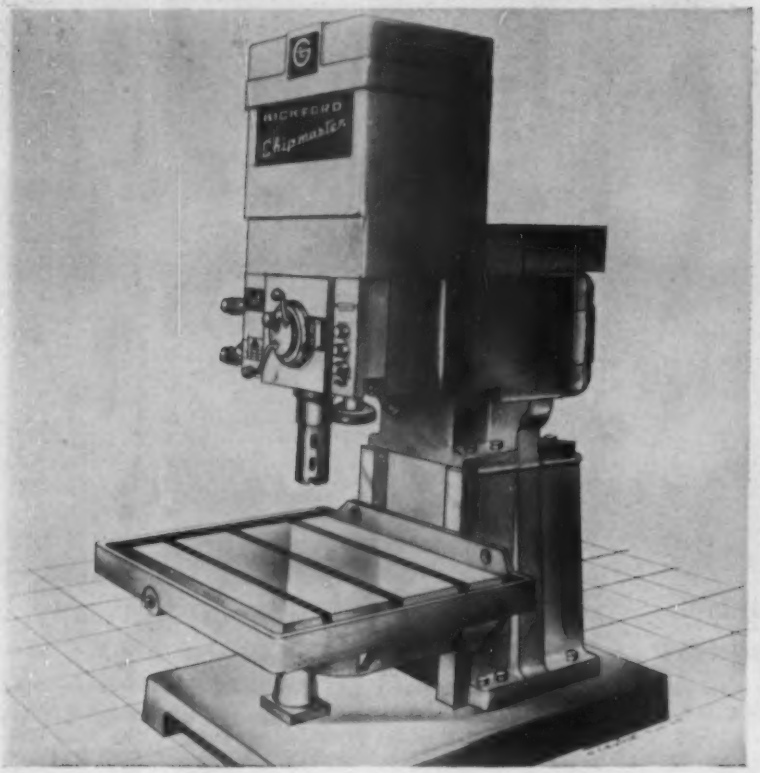
Giddings & Lewis Machine Tool Co, Fond du Lac, Wis —Booth 1320

MORE DATA? Circle 154, inside back cover



SIX-SPINDLE TURRET DRILL, Turret-Dex Model 250, is available as a standard automatic hydraulic machine or as a numerically controlled machine with a two-axis work positioning table (illustrated). Shown here with a Micro-Path tape-control system, machine features preselection of speeds and feeds, tapping on any spindle; boring type spindles; twelve spindle speeds in six ranges (max speed, 3000 rpm); fifteen feed rates, 0-120 ipm; positioning tables in five sizes from 14x24 in. to 32x40 in. (AM/MM—July 25 '60, p141) *—Avey Division, Motch & Merryweather Machinery Co, Cincinnati 1, Ohio*—Booth 822

MORE DATA? Circle 155, inside back cover



G & L 30-in. Upright Drilling Machine Has Radial Controls

First standard machine in a new line of upright drilling machines is a 30-in. unit with a 25 x 30-in. elevating table (optional compound) and single dial scale in front-mounted control grouping. All controls are in front of machine for convenience. Speeds and feeds are controlled by hand levers on head. Gear shifting is mechanical with positive hydraulic locking gear.

The 10-hp machine is a new design for production and layout drilling. It has 12 spindle speeds from 60 to 2400 rpm, 9 spindle feeds from 0.002 to 0.040 ipr, and 8 and 11½ tap leads. Automatic electric tapping reverse is provided. Dwell time is button-selected.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA? Circle 156, inside back cover

Natco Introduces Numerically Controlled Drilling Machine

This drilling, tapping, milling machine combines a Natco numerically controlled positioning table with numerical control of head and spindle for exact depth control, spindle speeds, feeds, and reversal for taps.

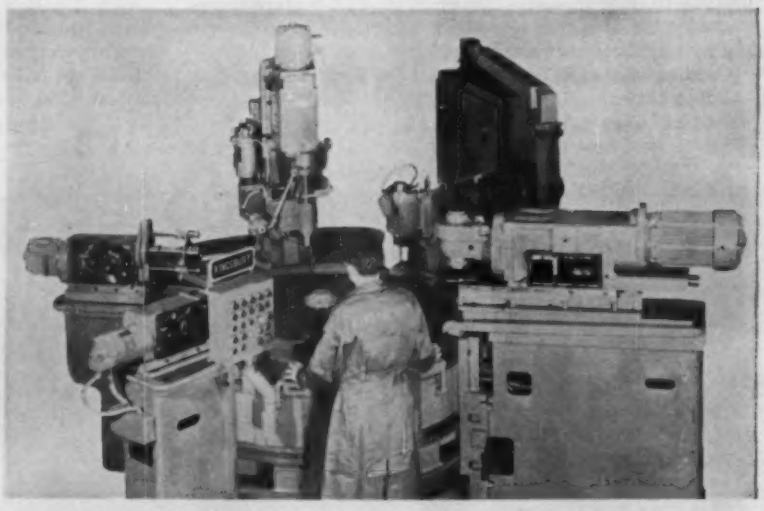
Because this machine has a quick-change tool holder, it is easy to change pre-set tools during the brief hole-to-hole movement intervals. To put the right tool always at the operator's finger-tips, the drill is equipped with a numerically controlled "tool presenter."

National Automatic Tool Co, Inc, Richmond, Ind—Booth 1205

MORE DATA? Circle 157, inside back cover

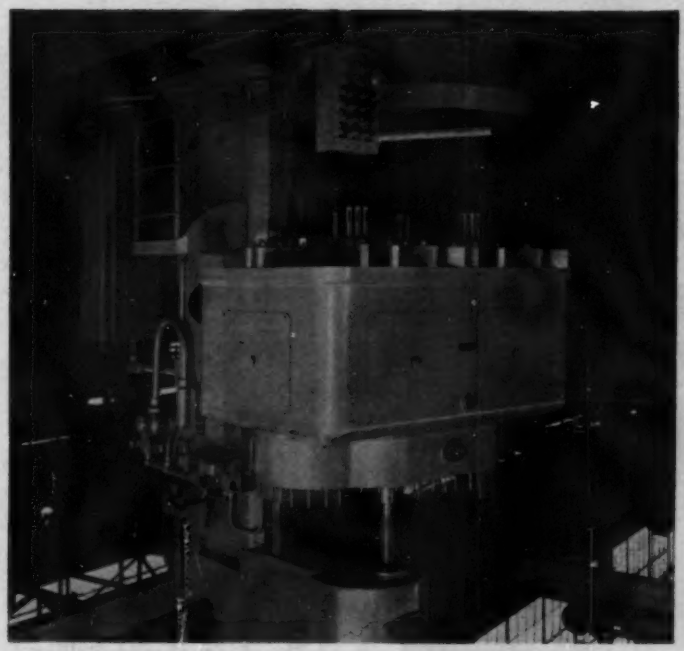
HOLLOW SPINDLE DRILLING MACHINE, designed for use with cold point and diamond impregnated bits on superhard materials at speeds up to 10,000 rpm, has accurately balanced hollow spindle and 100 psi coolant system (AM—Oct 5 '59, p129) —*Buffalo Forge Co, Dept 4, 490 Broadway, Buffalo 5, NY*—Booth 551

MORE DATA? Circle 158, inside back cover



DRILLING AND TAPPING MACHINE with 40-in. index table and no center column consists of a model 4 drilling unit with 4-in. stroke; a model 16 drilling unit with 5-in. stroke and self-opening die head; a vertical model 16 drilling unit with an angular-feed drilling head; a model 32 drilling unit with 3½-in. stroke and a 3400-rpm milling head; and a model 24 drilling unit with screw feed and a model 157 milling head, both mounted on a wing base built to building block standards—*Kingsbury Machine Tool Corp, Keene, NH*—Booth 731

MORE DATA? Circle 159, inside back cover



DRILLING AND TAPPING MACHINE, Model 1½F, fulfills the need for drilling and tapping with capacity between the standard No. 1 and No. 2 machines. Capacity is ⅝ in. in cast iron. Floor models are available with 7-in. and 12-in. overhang; bench model, with 7-in. overhang—*Edlund Machinery Co, Cortland, NY*—Booth 531

MORE DATA? Circle 161, inside back cover

New Natco FB Line of Multiple Spindle Machines Drill and Tap with Same Head

These machines, two versions of which will be at the Show, are large vertical machines with provisions for both drilling and tapping in the same head. Electric clutches in the neck permit shifting from drilling to tapping spindles or vice versa without delay. Drilling or tapping spindles can be selected automatically or at the touch of a button. The use of a single speed motor and clutches allows many more tapping reversals per minute than a two-speed motor could take without overheating.

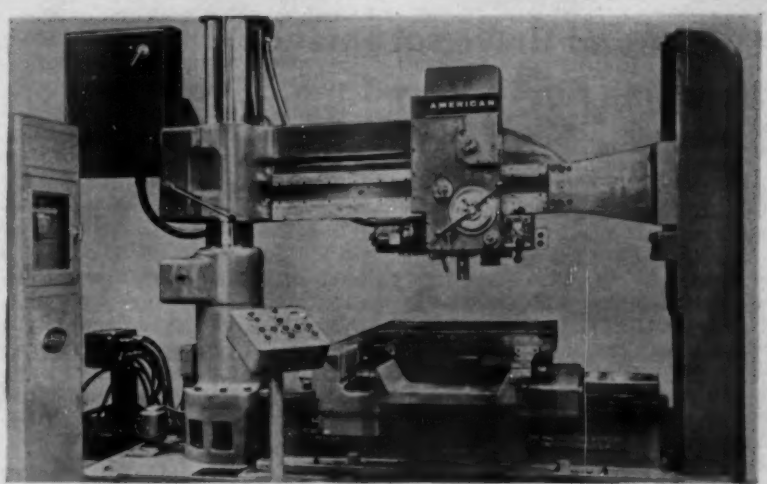
The F4B machine (illustrated) has a 30 x 54 in. drilling area and delivers 30 hp and 25,000 lb thrust at the spindle. It is equipped for demonstration with a three-station rotary table.

The F2B machine on exhibit is equipped with a straight-line indexing fixture. Electrical circuits for fixture switching are built into the machine, but all solenoids and hydraulic controls are mounted externally for easy maintenance. This size machine has a 19 x 24 in. drilling-tapping area, a 7½ hp spindle drive, and delivers 8100 lb of thrust.

Other sizes of these machines are available with many options.

National Automatic Tool Co, Inc, Richmond, Ind—Booth 1205

MORE DATA? Circle 160, inside back cover



American Tool Works Adds Depth Control To Its Tape-Controlled Radial Drill

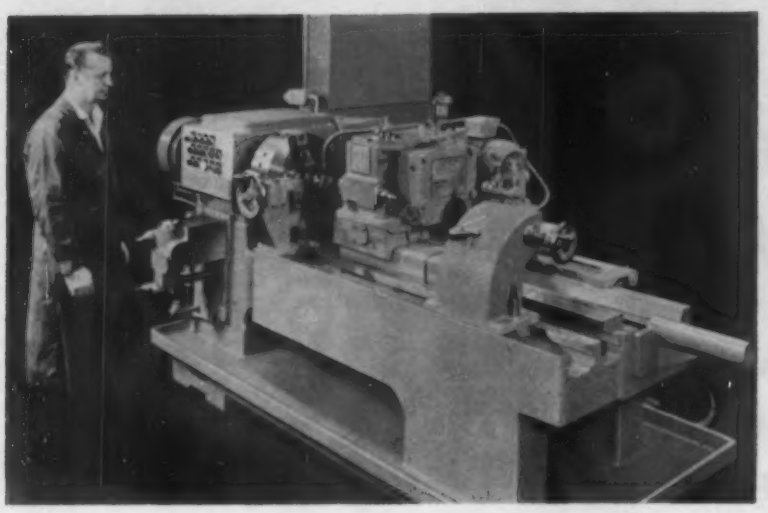
Latest improvement in the company's tape-controlled boring and drilling machine (an American 11-in.-column radial drill plus a tape-controlled positioning table) is the addition of depth control to the machine spindle. The automatic, tape-controlled spindle cycle provides traverse of the spindle to the starting point, control of the spindle under feed and speeds as selected by the operator to a pre-selected depth, than traverse of the spindle back to the starting point. Controls are automatic, but are set manually on dials.

American Tool Works Co. Pearl St at Eggleston Ave, Cincinnati 2, Ohio—Booth 381

MORE DATA? Circle 162, inside back cover

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Tapping and Threading



Sundstrand Universal Thread Miller Uses Sine Bar to Vary Thread Lead

This automatic, universal thread miller cuts left-hand, right-hand, external, internal, straight, tapered, or special threads by sine bar adjustment, without changing any gears or cams. A simple dial setting of the sine bar gives you the desired right- or left-hand lead.

Any lead up to ½ in. can be set on the dial, which is graduated to 0.0002 in. The machine makes use of multiple thread cutters having no lead but having the desired pitch and thread form. The cutter is fed to depth, and while the work makes one revolution the cutter moves lengthwise along the work.

No special operator skills are needed to setup and operate the machine. It can thread close to shoulders or to the bottom of blind holes, or thread parts impractical or impossible to thread in any other way. Cycle is completety automatic. An automatic or manual facing unit can be provided to face the part square.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 163, inside back cover

Reed Thru-Feed Thread Rolling Machine Handles 20 ft Bars

Model A25 is a simplified thru-feed thread rolling machine designed to handle bar lengths to 20 ft and diameters to 2½ in. OD. The stress ring of the A25 is of new design and is extremely rigid. This minimizes spring during heavy rolling loads.

The use of anti-friction bearings throughout gives maximum horsepower at the dies. Skew adjustment is accurate to 20 sec of arc (0.0001 in.), simple to use, and not influenced by other adjustments.

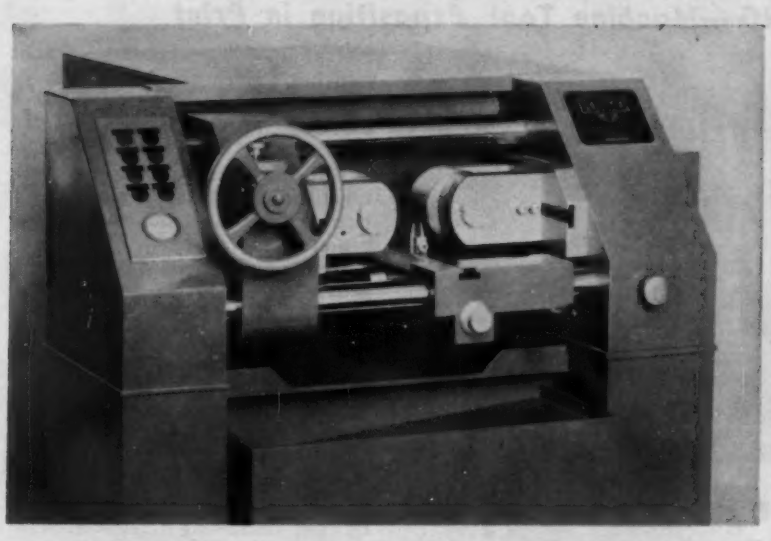
The sizing adjustment is read directly in 0.001 increments off the large size adjusting ring, and therefore it is easy to control to close tolerances. For convenience, a light is built into the die matching compartment.

Reed Rolled Thread Die Co, 791 Main St, Holden, Mass—Booth 421

MORE DATA? Circle 164, inside back cover

EXHIBITORS SHOWING TAPPING AND THREADING EQUIPMENT

BOOTH	EXHIBITOR
828	Bodine Corp Bridgeport 5, Conn
745	The Eastern Machine Screw Corp New Haven 6, Conn
486	The Hamilton Tool Co Hamilton, Ohio
839	Jones & Lamson Machine Company Springfield, Vt
731	Kingsbury Machine Tool Corp Keene, N H
432	Landis Machine Co Waynesboro, Penn
1205	National Automatic Tool Co, Inc Richmond, Ind
421	Reed Rolled Thread Die Company Holden, Mass
247	Snow Manufacturing Co Bellwood, Ill
1014	Sundstrand Machine Tool Co Rockford, Ill
451	The Warner & Swasey Co Cleveland 3, Ohio



Reed In-Feed Thread Rolling Machine Adapts to High Speed Production

Model B150 was designed with the plant operator in mind who needs a machine for both in-feeding of large diameter work and a machine that can produce at high speeds on parts 1 in. OD and under. It is designed for 5 in. dia in-feed capacity, and can be purchased as an in-feed machine only.

With the correct dies and feeding mechanism, the B150 can be used as a high speed threading machine. It has the following features: hydraulic servo mechanism which controls die penetration rates; overload control to protect dies from damage should oversize blanks accidentally be rolled; a detachable hydraulic system. The 12 in. die gap is adjustable to accept various die face combinations for double end studs up to 11 in. long.

The model B150T, similar to the B150, has the added feature of being able to thru feed long bars. In addition, this machine has the capacity for thru-feed thread rolling up to 2½-in. major dia and 20 ft in length.

The only requirement necessary to convert the B150 or B150T to high speed production is to install work-handling equipment and the correct set of dies.

Reed Rolled Thread Die Co, 791 Main St, Holden, Mass—Booth 421

MORE DATA? Circle 165, inside back cover

Reed Threading Machine Operates At Over 200 Pieces per Minute

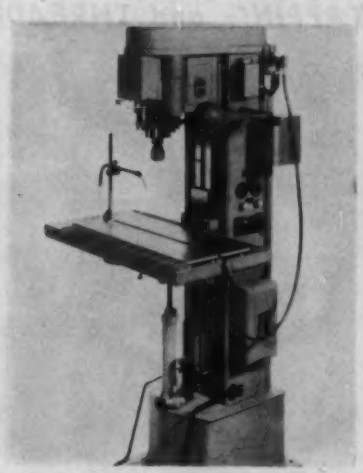
Model B910 is a two cylindrical die general purpose threading machine that carries production rates in excess of 200 pieces per minute in a size range from ⅜—1 in. Production rates vary with size, length of thread, and hardness of material. The machine is also designed to thread double end studs up to 11 in. long at production rates.

The machine has a patented new die design with unique but simple loading and unloading mechanism. Although basically intended for production as a fully automatic hopper-fed machine, the B910 can be furnished with additional speed changes to reduce the production rates for manual, or semi-automatic feeding on short runs.

In its construction, the machine has a tie-bar type of stress support system—one which has very high stiffness with a minimum amount of material, and longitudinal members are stressed in tension. Anti-friction bearings are throughout the gear shafts and die-spindle systems, which are also provided with automatic lubrication.

Reed Rolled Thread Die Co, 791 Main St, Holden, Mass—Booth 421

MORE DATA? Circle 166, inside back cover



Snow Vertical Tapping Machine Has Capacity of ¼—⅝-in.

A new direct drive vertical tapping machine, with capacity from ¼—⅝ in. in mild steel, has spindle speed ranges from 300—1000 rpm. The work table is positioned by air for quick change of tools and fixtures.

Solenoid units built into the machine synchronize air - operated clamping and indexing fixtures with spindle cycle. The machine is ideally suited to tapping alloy and heat treated materials.

Snow Mfg Co, 435 Eastern Ave, Bellwood, Ill—Booth 247

MORE DATA? Circle 167, inside back cover

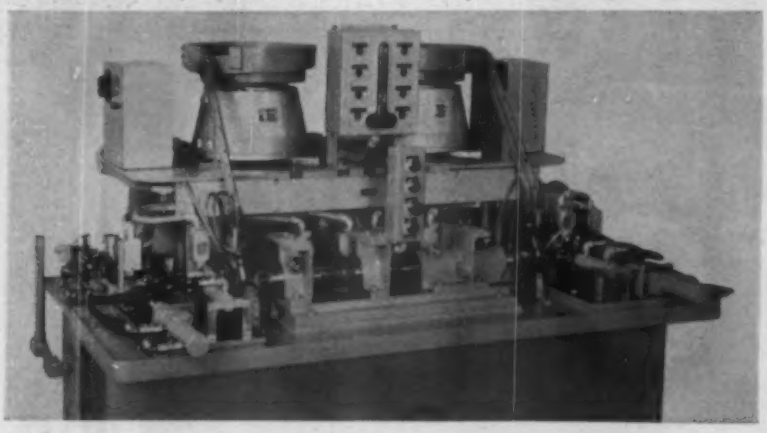
Reed Three-Die Machine Does Thru-Feed Involute Rolling

This new three cylindrical die model is designed for thru-feed involute form rolling. Considerable interest has been shown by the automotive industry in the three-die principle for rolling accurate involute splines and serrations as well as for burnishing the variety of involute gears commonly used.

The skew system in this Model A425 is accurate to 20 sec of arc (0.001 in.) and is rigid and simple to adjust. Because this system is entirely independent of the size control, setup procedure is simplified. The sizing adjustment is direct, simple, and gives extremely close tolerances.

Reed Rolled Thread Die Co, 791 Main St, Holden, Mass—Booth 421

MORE DATA? Circle 168, inside back cover



Almost All Motions Are Productive on Bodine Double Ended Continuous Tapper

On Model 58 double ended continuous tapper, which is essentially a lead screw spindle with tap holders on each end, the spindle is tapping on one end while withdrawing on the other. Thus, practically all motions are productive. The spindle is driven by a heavy duty high reversal motor especially designed for this machine.

Completely automatic, the machine at the Show is tooled to tap T-nuts. The nuts come to the machine completely cylindrical and the flanges are shaped into prongs or dimpled for welding after tapping.

The tapper runs at approximately 65 strokes per min in tapping 5/16 NC-18 holes in hard-drawn steel. Because the machine is automatic, one operator can load hoppers and change taps in a large battery of such machines.

Electrically, the machine has dc braking for reversal and is completely interlocked to prevent damage to the spindle or tooling. Plug-in limit switches (which give a minimum of maintenance downtime) check for complete index, clamping pressure, and failure of the spindle stop switches or air pressure. Any malfunctions stop the spindle, and a trouble-light panel indicates the location of the failure.

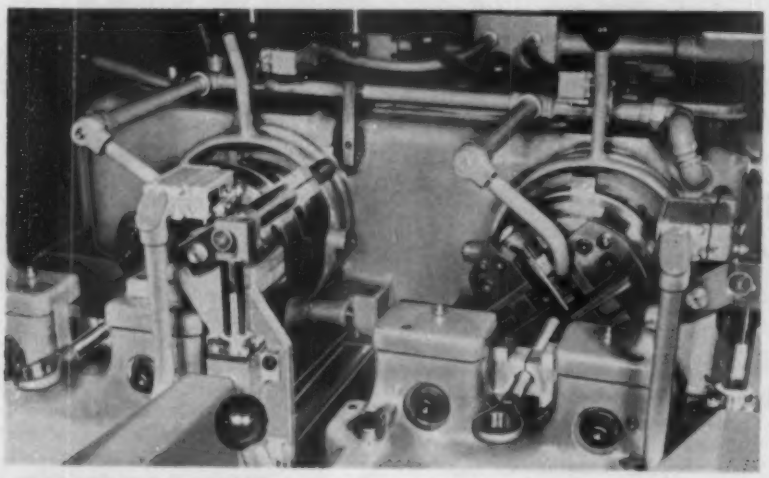
Tapping of standard hexagon or square-nut blanks can be performed at various speeds on a wide range of tap sizes. On a ¼-in.-20 tap, for instance, gross production rate per hour is 13,500 at 80 sfm, 18,000 at 120 sfm. (These previous figures assume use of three spindle heads.)

According to the manufacturer, the machine is particularly well adapted to handling parts with any of the following characteristics: parts that can be fed by hopper; parts that require close-tolerance threads; parts that require clamping for tapping operations; parts that require squareness of thread relative to some reference surface.

The basic machine will accommodate a wide variety of hopper feeding equipment. Tooling consists of hoppers with related transfer mechanisms, fixtures, and ejectors.

The Bodine Corp, 317 Mountain Grove St, Bridgeport 5, Conn—Booth 828

MORE DATA? Circle 169, inside back cover



Landis Machine Thread Cutter Should Increase Production Efficiency

A hydraulically controlled, semi-automatic thread cutting machine—the 12C double spindle Landmaco—has been designed to increase production efficiency in threading operations. It has a diametrical range of ⅜—1½ in. and an eight speed gear box having a 47—113 rpm range.

Because the entire threading operation for each machine carriage is controlled by a single "joy stick" type 3-position switch, the only actual manual operation required is to insert a new blank at the beginning of the cycle and remove it upon its completion. One position opens the grips, a second closes them, and a third initiates the threading cycle.

In operation, the grips close, the workshop drops down away from the work, and the carriage rapid-traverses to the "start thread" position. The rapid traverse stops, the leadscrew engages to control carriage movement until the thread is completed. Now the die head opens, the leadscrew disengages, and the carriage rapid-traverses to the load position. The grips then open and the workstop drops down away from for positioning and loading.

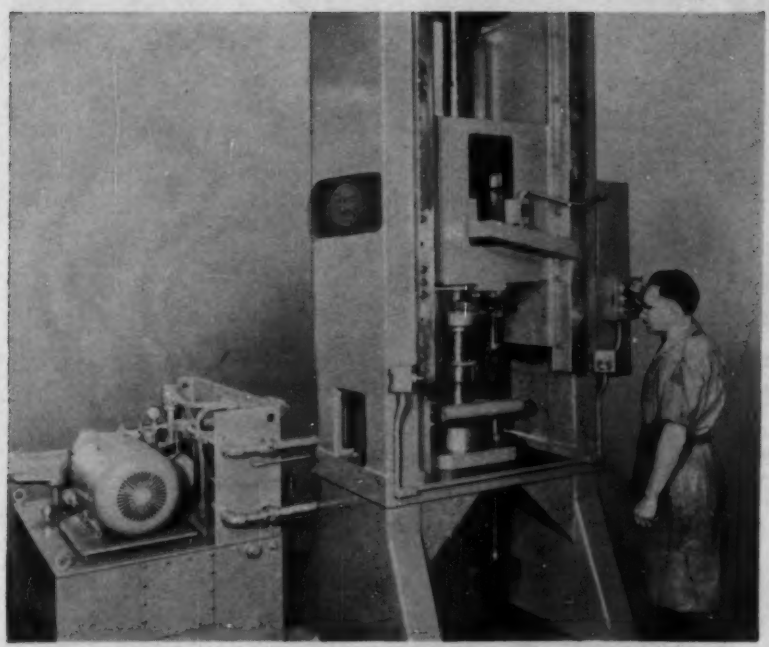
At the show, this machine will be doing production threading of sample workpieces.

Landis Machine Co, Waynesboro, Pa—Booth 432

MORE DATA? Circle 170, inside back cover

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Broaching



Red Ring Vertical Hydraulic Broach Produces Gears and Other Toothed Forms

This pot-type broaching machine is especially designed to produce spur and helical gears and other toothed forms on the outside diameter of a part by making use of a one-piece broaching tool made in the form of an internal gear.

Machine has a 24-in. stroke, occupies a floorspace approximately 51x42 in. The hydraulic unit at the side of the machine occupies a 54x54-in. space, and is equipped with a 20-hp motor and a 29-gpm pump.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich—Booth 1430

MORE DATA? Circle 171, inside back cover

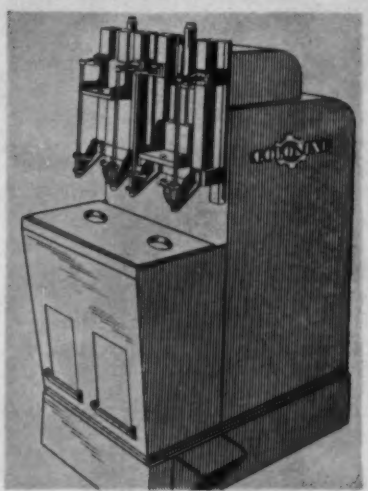
Lapointe 1½-Ton SPD Broach Has Automatic Puller, Coolant

One part is broached at a time in a single-part nest held by the Lapointe 1½-ton broaching machine. Equipment includes part nest, automatic puller, and coolant equipment.

Broaching speeds range from 5 to 10 fpm. Stroke length is 12 in.

Lapointe Machine Tool Co, Hudson, Mass—Booth 1229

MORE DATA? Circle 172, inside back cover



Colonial Broach Introduces New Twin-Ram Pulldown Broacher

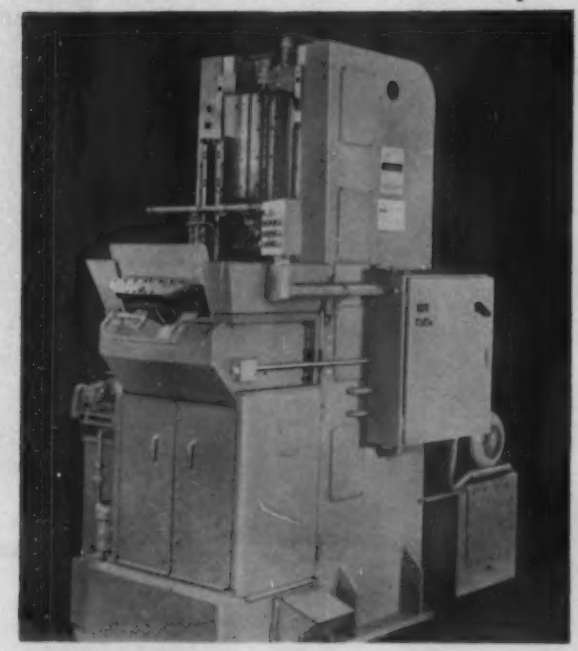
In their new broaching machine, the RDT-6-42, Colonial Broach has applied the twin-ram principle—in which the rams travel in continuously opposed directions—to a surface broaching machine.

Colonial Broach & Machine Co, P O Box 37, Harper Station, Detroit 13, Mich—Booth 241

MORE DATA? Circle 173, inside back cover

EXHIBITORS SHOWING BROACHING EQUIPMENT

BOOTH	EXHIBITOR
1034	The Cincinnati Milling Machine Co, Machine Tool Division Cincinnati 9, Ohio
241	Colonial Broach & Machine Company Detroit 13, Michigan
1229	The Lapointe Machine Tool Co Hudson, Mass
1430	National Broach & Machine Co Detroit 13, Michigan
1014	Sundstrand Machine Tool Co Rockford, Ill



Building-Block Broach Converts Easily From Surface to Pull or to Push Broaching

The Sundstrand-American Broach three-way vertical broaching machine is composed of building block units. Interchangeable standard components make it possible to convert the machine rapidly and economically from surface broaching to pull or push broaching.

Designated the Model T3, the machine consists of the following basic standard units:

Column unit—This has rectangular, hardened and ground steel ways, and a hydraulc cylinder. Column has finished surfaces for mounting work tables and coolant reservoir.

Wide slide unit—Cast-iron slide will accommodate pull head or retriever unit at either end for pull-up or pull-down for internal broaching, will also accommodate surface broach baseplates for surface broaching.

Table units—three interchangeable units are available—straight stationary table, 45° sliding table, and a tilting table. Stationary table can be inverted for pull-up operation.

Hydraulic unit—Unit mounts at rear of machine. Rated broaching speed is 16—30 fpm

Coolant unit—pump is mounted at side of column. Reservoir is attached to front of column.

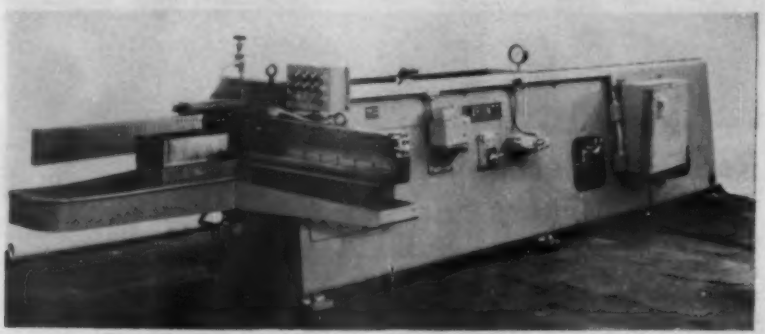
Control unit—This provides safety dual pushbuttons for broach and return strokes. Limit-switch cams adjust stroke. Selector switch provides semi-automatic and inching cycles. Pushbuttons control hydraulic drive and coolant.

Retriever unit—Unit can be mounted on either end of slide. It contains its own slide, and can handle broaching tools from 25 to 50 in.

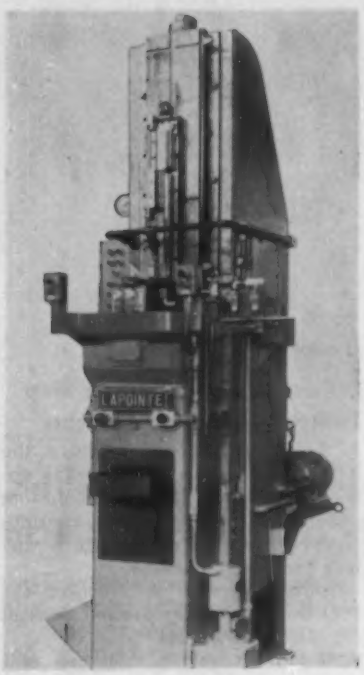
Machine to be demonstrated has a 15-ton, 42-in. stroke capacity. Broaching speed is adjustable from 16 to 30 fpm; return speed is 58 fpm.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 174, inside back cover



LAPOINTE HP-30 HORIZONTAL BROACHING MACHINE is a 15-ton unit with hydraulically operated vise fixture that will grip bar stock so that the ends can be squared. Maximum bar size is 5¾ in. square. Broach, designed to run integrally with fixture, removes 0.064 in. per pass; it is checked with a thousandths indicator when the second end is broached—*Lapointe Machine Tool Co, Hudson, Mass*—Booth 1229 MORE DATA? Circle 175, inside back cover



Lapointe 5-ton UVHS Broach Is Single-Ram Vertical Unit

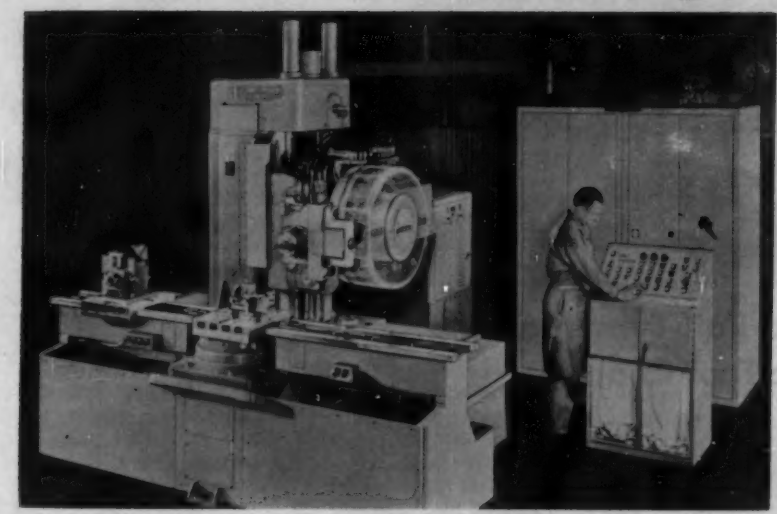
Vertical broaching machine is fully automatic, with machine-controlled bar-stock feed, clamp, broach, and cutoff to required length. Cutting speed for a typical part is 30 fpm, with production at 175/hr. As shown, the machine is tooled for a rifle cartridge extractor.

Lapointe Machine Tool Co, Hudson, Mass—Booth 1229

MORE DATA, Circle 176, inside back cover

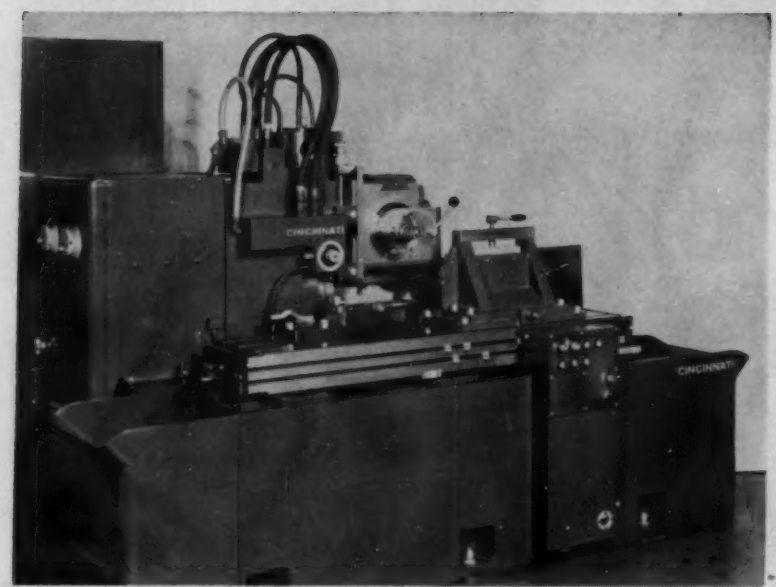
MMT=PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

Milling



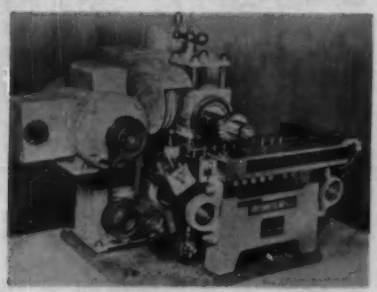
MILWAUKEE-MATIC MODEL II features several improvements over the earlier Model II. Speed ranges are from 0-4000 rpm in increments of 10 rpm; feed range is from 2-99 ipm in increments of 2 ipm, with rapid traverse rate of 200 ipm. The three axes of motion, X-longitudinal, Y-vertical, and Z-depth, respectively, have ranges of 24, 20, and 16 in. — *Kearney & Trecker Corp, Milwaukee 14, Wis* — Booth 1008

MORE DATA? Circle 178, inside back cover



BED-TYPE MILLING MACHINES, 100 and 200 Series Hypowermatics, are available in plain or duplex models and can be furnished with either automatic rise-and-fall spindle carriers or with tracer control of spindle carriers. Table widths are 12 in. for the 100 Series and 15 in. for the 200 Series. The 12-in. tables are available in four lengths from 59 to 83 in.; the 15-in. tables in four lengths from 71 to 107 in. Feed rate is adjustable from 1 to 150 ipm, with a rapid traverse of 300 ipm (AM—Nov 16 '59, p185)—*Cincinnati Milling Machine Co, Cincinnati 9, Ohio*—Booth 1034

MORE DATA? Circle 177, inside back cover



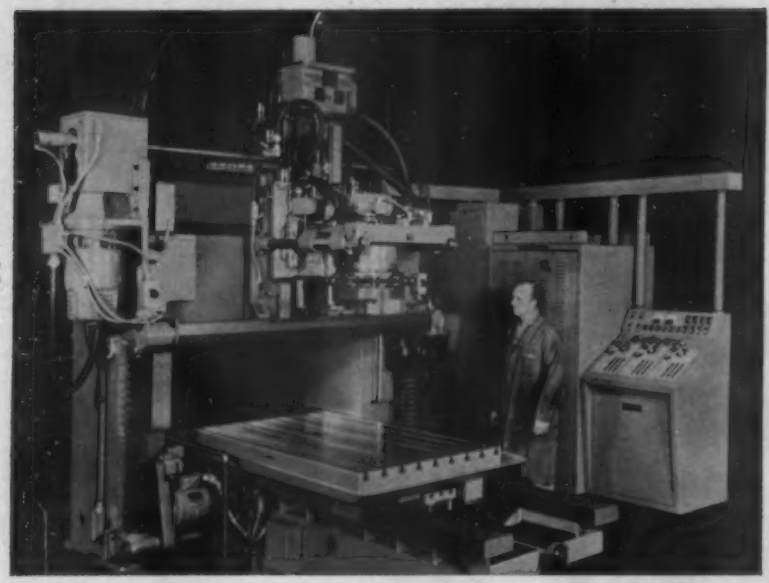
Automatic Handling Attachment Works on Miller or Unit Head

Baird AutomaticMill is a chain-driven device for parts handling, attachable to any milling machine or to its own low-cost built-in milling head. It moves small parts such as toolbits or electronic components past the cutters, holding tolerances as close as ±0.001 in. Individual jaws that carry the parts through a cycle can exert 50 to 1000 lb holding pressure.

Chain drive moves continuously as parts are hand- or hopper-fed into the jaws, which close and open automatically. The equipment has air wipers that remove chips and dirt from the jaws before new parts are placed for the cutting operation. Production rate can be as high as 6000 an hr. Part size may range from 0.05 x ¼ in. to 1 in. square.

The Baird Machine Co, 1700 Stratford Ave, Stratford, Conn — Booth 1142

MORE DATA? Circle 179, inside back cover



Numerically Controlled Rail-Type Machine Has 20-Unit Automatic Tool Changer

Three-axis numerical control of this Model 21 vertical-spindle rail-type machine provides 60-in. table travel, 40-in. head cross-travel, and 24-in. head vertical stroke. The 66½x44-in. table positions at a speed of 150 ipm and feeds at rates infinitely adjustable between 4 and 150 ipm.

The horizontal rail, supported on each end by cast-iron columns, has a 28-in. vertical adjustment, from 4 in. above the table to 32 in. above the table. Horizontal ways on the rail carry the spindle saddle and provide 40 in. of cross travel. Cross-travel positioning rate is 150 ipm. Cross-travel feed rate is infinitely adjustable between 4 and 150 ipm.

The saddle has vertical ways which carry the 5-hp vertical spindle head. This head has a total vertical travel of 24 in., including a 12-in. feed stroke. Vertical feed rates are adjustable from ½ to 150 ipm. Three spindle speed ranges cover speeds from 105 to 2000 rpm.

A 20-unit automatic tool changer enables the machine to perform a great variety of machining operations.

The numerical control system provides continuous automatic cycles including positioning, feeds, speeds, and tool selection. Standard control components provide manual operation of all functions.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 180, inside back cover

Several Natco Machining Units Operate on Transfer Line

New FA, FF, FG, and FA machining units will all be displayed on an operating transfer line in Natco's booth. The FA units are for vertical operation and consist of a column, slide, head, and self-contained power supply.

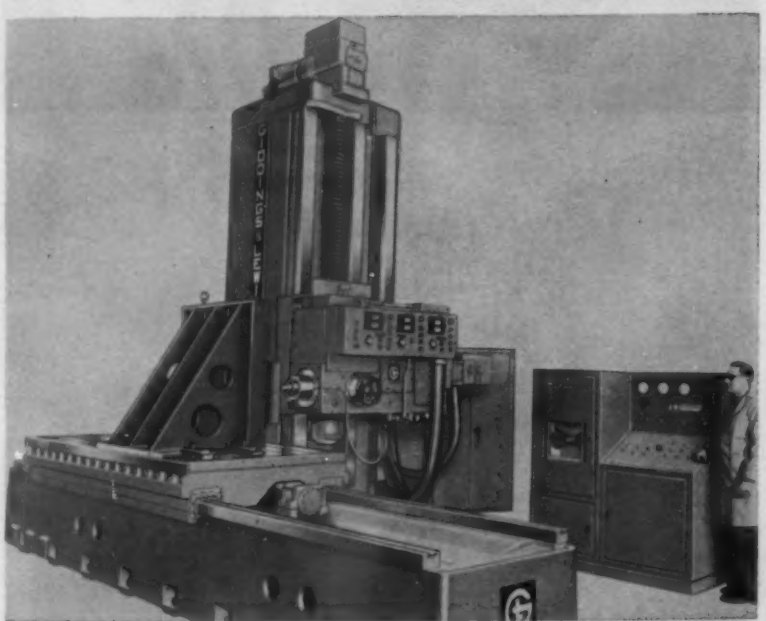
The FF "hole units" are for operation at any angle. With the exception of their hydraulic power supply, they conform to building block standards.

The FG units conform fully to JIC standards for building block transfer machine elements. Like the FF units, they can be operated at any angle and are mounted on thin, flat bases. However, the hydraulic power supply is a separate unit.

The FA units are for milling, and can be supplied in many versions: gear drive, belt drive, left hand, right hand, horizontal, vertical.

National Automatic Tool Co, Inc, Richmond, Ind—Booth 1205

MORE DATA? Circle 181, inside back cover



"Numeripath" Tape Controls G & L Mill With Horizontal Spindle, 4x8-Ft Table

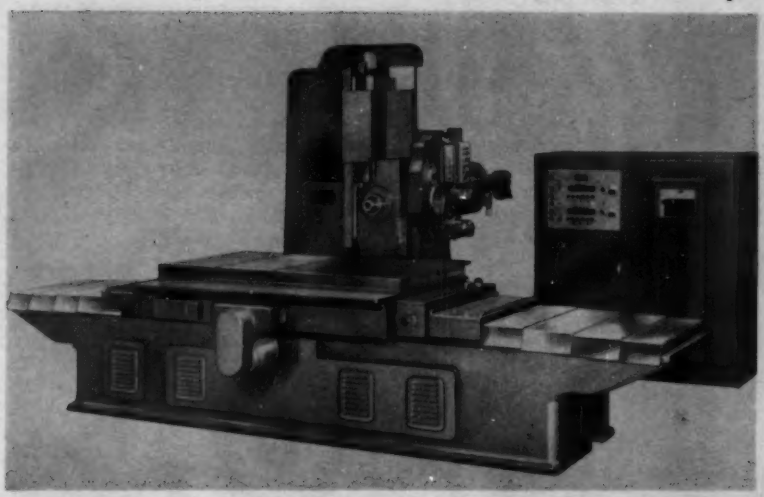
DiMil is claimed to operate 25% faster than existing tracer-controlled die-sinking and contour-milling machines without sacrifice in tool life.

The mill has 84 in. of table travel, 72 in. of vertical head travel, and 18 in. of depth travel to the headstock. Milling feeds with tape control are zero to 60 ipm, rapid traverse is 90 ipm, and spindle speeds are 8½ to 1800 rpm.

The machine is intended for deep-die work, with gravity drop-off for chips. Alternate controls are available; numerical or hand.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis—Booth 1320

MORE DATA? Circle 182, inside back cover



DeVlieg Introduces New Series of Jigmils With Point-to-Point Positioning Controls

The new "H" series Jigmils, available in spindle sizes from 3 in. to 5 in., greatly increase Jigmil range for precision boring, milling, drilling, and other operations. Features incorporated into the new series include simplified controls and thermal control of main spindle bearing for increased accuracy. Wider beds and tables add stability and increase the working range. Stainless steel bedway covers provide positive protection from chips and dirt.

The Model 3H-72 (illustrated) will be equipped with Tapac, DeVlieg's new system of automatic tape control. Tapac is a point-to-point system for automatic measuring, positioning, and cycling complete programs, utilizing 1-in. 8-channel punched-tape input.

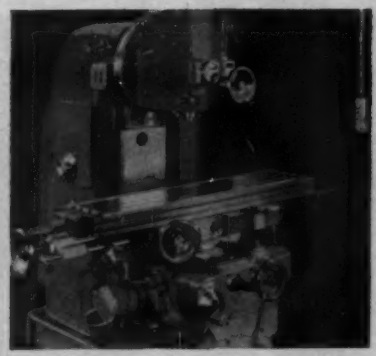
Machine functions such as selection of spindle speeds and feeds; control of spindle depth of feed; automatic spindle rapid traverse, feed, and retraction; as well as automatic advance to new hole locations can be programmed. Tapac also provides automatic slide locking, tool change indication, and operation number designation.

Simplified programming minimizes errors. Many of the automatic machine movements are functions of the electrical sequences of the machine itself and do not have to be put on the tape. Only basic information need be put on the tape —horizontal and vertical dimensional settings, spindle speeds and feeds, depth settings, and tool change.

Also to be shown is Model 3H-48, which will be equipped with the Diatrol direct dial dimensioning system (*AM*—Jul 13 '59, p149).

DeVlieg Machine Co, Fair Street, Royal Oak, Mich—Booth 431

MORE DATA? Circle 183, inside back cover



Sundstrand 15-hp Vertical Miller Has Swiveling Head, Power Quill

Model 30 vertical knee-type miller features a swiveling head which makes possible angular milling cuts crosswise to the table. The power quill permits boring and drilling operations square with the face of the angular cuts.

Pendant control panel provides machine start and stop, spindle start and stop, spindle reverse, coolant, power rapid (jog), quill feed and rapid. Handcranks positively disengage during power feed or rapid traverse. Automatic backlash eliminator permits climb milling in either direction.

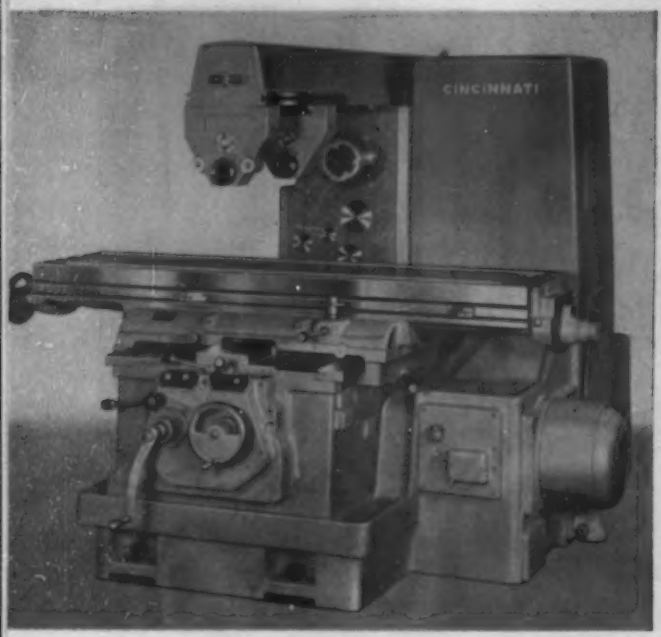
This 15-hp miller has 24 speed selections from 20 to 1600 rpm, and 36 longitudinal and cross-feed rates in geometric progression from ½ to 90 ipm. Vertical feed rate ranges from ¼ to 45 ipm. The table has a working surface of 15x65 in., longitudinal travel of 36 in., cross travel of 12 in., and a vertical travel of 18 in. Maximum distance from top of table to spindle face is 22¾ in.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 184, inside back cover

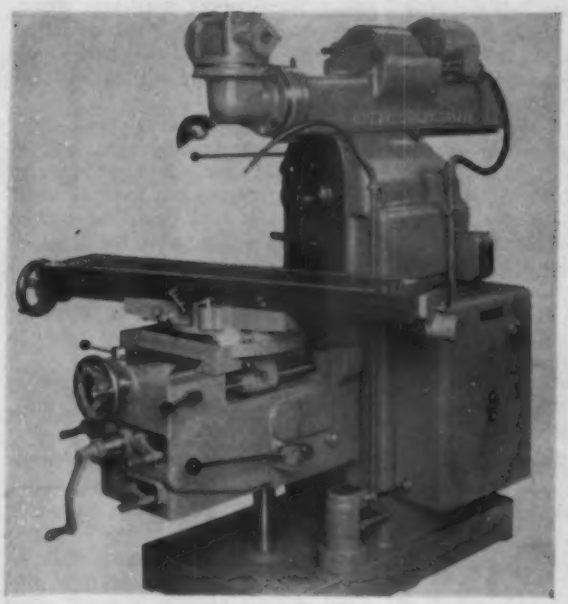
EXHIBITORS SHOWING MILLING EQUIPMENT

BOOTH	EXHIBITOR
1406	American Steel Foundries Elmes & King Divisions Cincinnati 29, Ohio
1142	The Baird Machine Co Stratford, Conn
452	Brown & Sharpe Mfg Co Providence, R I
849	The Carlton Machine Tool Co Cincinnati 25, Ohio
1326	The Cincinnati Gilbert Machine Tool Co Cincinnati 23, Ohio
1034	The Cincinnati Milling Machine Co Machine Tool Division Cincinnati 9, Ohio
241	Colonial Broach & Machine Company Detroit 13, Michigan
431	DeVlieg Machine Company Royal Oak, Michigan
331	Famco Machine Company Kenosha, Wisconsin
1320	Giddings & Lewis Machine Tool Company Fond du Lac, Wisconsin
1350	The G A Gray Co Cincinnati 7, Ohio
1439	Greaves Machine Tool Div, J A Fay & Egan Co Cincinnati 2, Ohio
1008	Kearney & Trecker Corp Wilwaukee 14, Wisconsin
1205	National Automatic Tool Co. Richmond, Ind
1001	Rockford Machine Tool Co Rockford, Ill
1014	Sundstrand Machine Tool Co Rockford, Ill
351	Van Norman Machine Co, Div of Van Norman Industries, Inc Springfield 7, Mass



GENERAL-PURPOSE MILLER has no movable knee. Vertical motion is provided by the spindle carrier. Machine has 32 feeds and 24 speeds, and is available in four models ranging from 20 to 30 hp, with 72 to 80-in. table travel, 12-in. saddle travel, and 20-in. vertical travel. Two individual sets of controls are provided to permit operator to observe cut at all times. Table can be cycled manually or automatically (AM—Nov 2 '59, p139)—*Cincinnati Milling Machine Co, Cincinnati 9, Ohio*—Booth 1034

MORE DATA? Circle 185, inside back cover



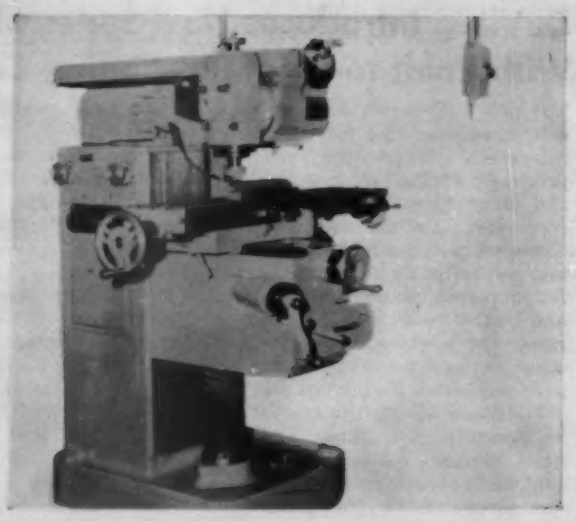
Greaves New 2-XH Milling Machine Comes in Plain and Universal Models

This new milling machine, available in both plain and universal models, has longitudinal, cross, and vertical rapid traverse at rate of 100 ipm. The table, which has T-slots, is 60¼ x 12 in.

Standard equipment on both models is: arbor support, wrenches, arbor draw bar, cutter coolant system, 7½ hp ball bearing motor, and electrical equipment.

Greaves Machine Tool Co, Div of J A Fay & Egan Co, Cincinnati 2, Ohio—Booth 1439

MORE DATA? Circle 186, inside back cover



Van Norman All-Purpose Millers Have Spindle Motor Mounted Within Ram

Spindle motors of the new IR-22-3 and IRQ-22-3 all-purpose milling machines are mounted within the all-geared ram to provide maximum cutting power. These machines are based on the company's 16 series and supplant models 16M and 16S, respectively.

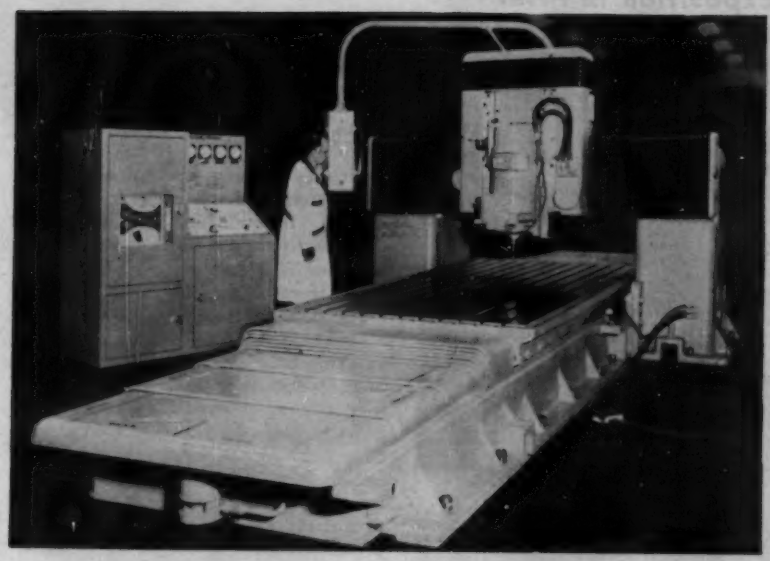
Equipped with a heavy-duty adjustable cutterhead for horizontal, angular, and vertical milling without disturbing the original setup, the IR-22-3 features an expanded range with increased clearance under the spindle.

The IRQ is equipped with a quill-type adjustable cutterhead that permits drilling, boring, and reaming, in addition to horizontal, angular, and vertical milling. Optical verniers simplify precision boring. Spindle speeds range from 100—3600 rpm.

Both units offer fingertip selection of 14 spindle speeds, nine table speeds, and dial selection of any combination of motor drive. Cutterheads on both machines are fully adjustable from the horizontal through vertical, and can be positively locked at any position.

Van Norman Machine Co, Springfield, Mass—Booth 351

MORE DATA? Circle 187, inside back cover



Ekstrom, Carlson 3-D Miller-Profiler Operates from Punched or Magnetic Tape

The 200-Series Eccomill continuous-path, tape-controlled milling and profiling machine is designed to meet the exacting demands of automatic machine-tool control systems and fully achieve the finer machining tolerances such systems make possible.

Covering a broad range of sizes (the machine shown here has a table work surface of 60x144 in.), the 200-Series machines feature traveling-table, vertical-spindle, bridge-type design, with multiple axis control.

Outstanding features include anti-backlash recirculating-ball-bearing precision screws on each axis; recirculating roller bearings on table, saddle, and vertical slide, operating on hardened and ground ways; Ekstrom-Carlson Dial Speed milling head with continuously adjustable spindle speeds from 15-6000 rpm; wipers and full way covers on all ways; optical viewers and precision scales on all axes of movement; and fingertip operation from pendant station.

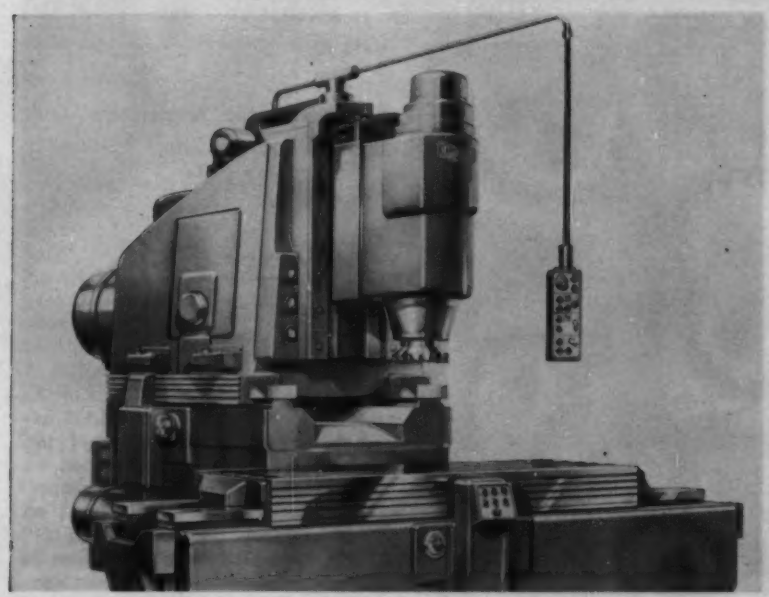
Either punched-tape or magnetic-tape control systems can be supplied. The machine illustrated is equipped with a General Electric Mark III numerical contouring control system.

Ekstrom, Carlson & Co, Rockford, Ill—Booth 846

MORE DATA? Circle 188, inside back cover

K&T's Vertical Bed-Type Miller Delivers 50 hp at Each Spindle Speed

Designed to meet the demand for a milling machine with the capacity of a large bed-type plus the versatility of a knee-type miller, the Model 3006 vertical bed-type Milwaukee-Mil delivers 50 hp at each of 24 spindle speeds ranging from 15-1500 rpm. Spindle speeds are selected and changed through an electro-hydraulic system directed from the pendant.



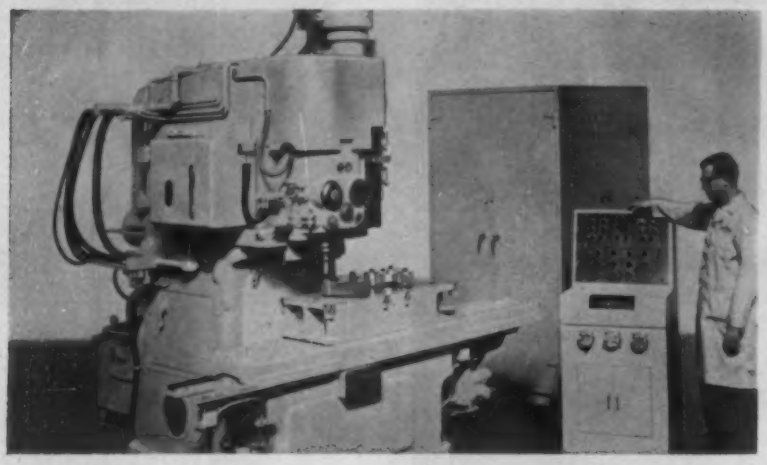
The vertical spindle head has its own 2-hp feed drive motor. An infinite number of feed rate changes ranging from ⅛ ipm to 75 ipm, with a rapid traverse rate of 100 ipm, power the head through its full vertical range of 26 in.

A 10-hp motor powers the ram and table motions. Each motion has infinitely adjustable feed rates between ¼ ipm and 150 ipm, with a rapid traverse rate of 200 ipm. Cross travel range (ram) is 33 in.; table travel range is 72 in. All feed rates—vertical head, ram and table are conveniently chosen through respective dials on the pendant. Feed rates are "locked in" by an electrical feedback system, which holds feed rate constant, independent of changes in load or voltage.

Ram and table cycles are directed by a simplified, automatic cycle system, and may be interlocked to facilitate square milling.

Kearney & Trecker Corp, Milwaukee 14, Wis—Booth 1008

MORE DATA? Circle 189, inside back cover



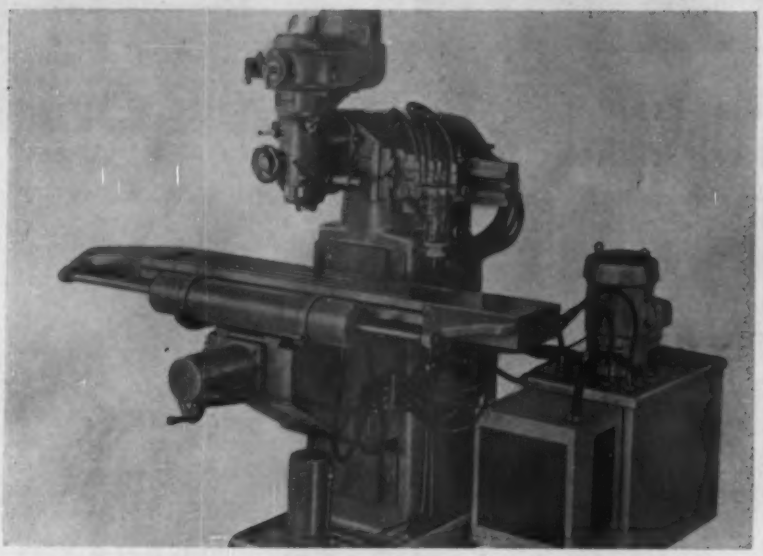
3-Axis Acramatic System Controls Hydro-Tel Miller

Intricate contours and variable-depth pockets are typical of the work performed on this 16-in. vertical Hydro-Tel milling machine equipped with Acramatic 3-axis numerical control. In addition, the parts can be reverse images, as in the illustration, without requiring a change of tape. Here a roughly shaped steel block is milled to blended circular, elliptical, and flat surfaces on its exterior profile, the exterior profile of three bosses, and an interior profiled pocket of varied depth.

With Acramatic numerical control, programming is greatly simplified because of the system's parabolic interpolation of data, fitting a curve to a curve rather than trying to approximate a curve with a large number of straight lines.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio—Booth 1034

MORE DATA? Circle 190, inside back cover



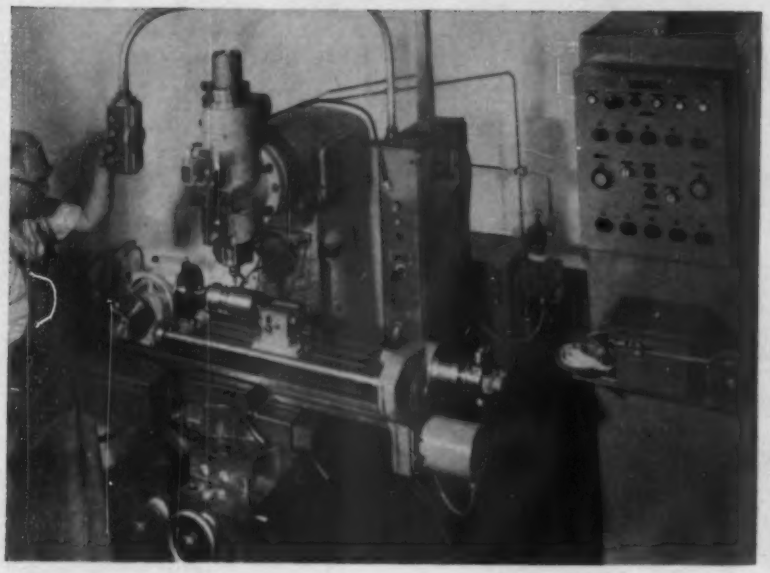
Numerically Controlled Miller Has 3-Axis Positioning

Numerical data taken from design information controls the Famco knee-style milling machine through automatic positioning of the table in three dimensions.

The machine has a new electro-hydraulic control of all table motions, with power cylinders mounted directly on each axis of motion. Customary head adjustments are retained.

Famco Machine Co, Kenosha, Wis—Booth 331

MORE DATA? Circle 191, inside back cover



Brown & Sharpe "Numericam" Cuts Unusual Contours, Hole Patterns

The "Numericam," a tape controlled cam milling machine, is a modified version of the new No. 2 vertical milling machine with a GE Mark II positioning control. It will machine unusual contours such as cylindrical, conical, and flat surface master cams. Hole patterns can also be machined in any of the above mentioned shapes.

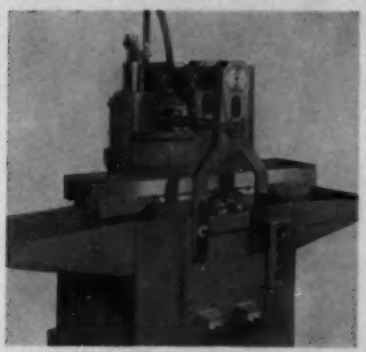
Master cams can be machined using a full automatic cycle of the Numericam, which is controlled by one inch wide, eight channel tapes. Data for the tapes is calculated on small research type computers.

The control system definition is 0.0001 in. for table motion; one hun-

dred thousandth of a circle for the index head which is also 0.0001 in. on a circle of 10 in. circumference. The table screw is accurate to 0.0005 in. in the 10 in. travel.

Brown & Sharpe Mfg Co, Providence, RI—Booth 452

MORE DATA? Circle 192, inside back cover

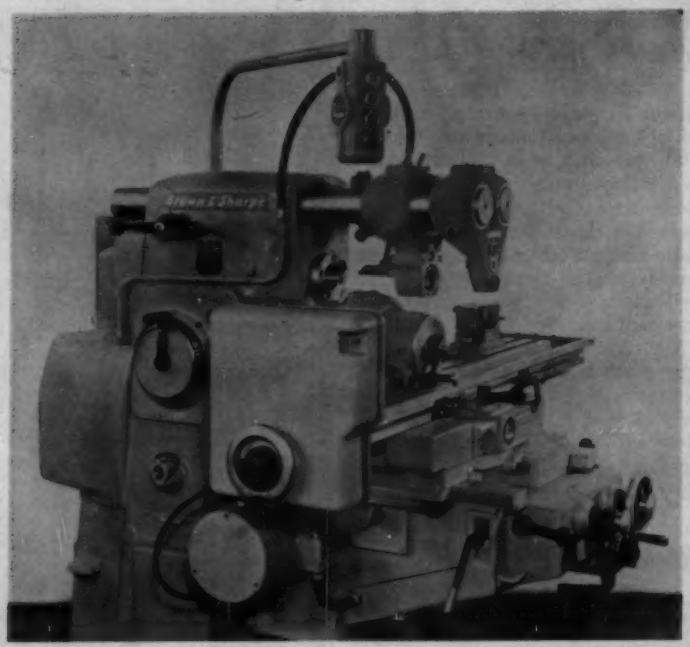


Kent-Owens Hydraulic Miller Does Conventional, Climb Milling

Model 2-24 and 2-24DS (double spindle) Kent-Owens milling machines have 1 x 4-ft tables with 2 ft of travel and 5 or 7½-hp motors. Design is simple and rugged. Improved hydraulic control and feed-rate controls with built-in heat compensators are features.

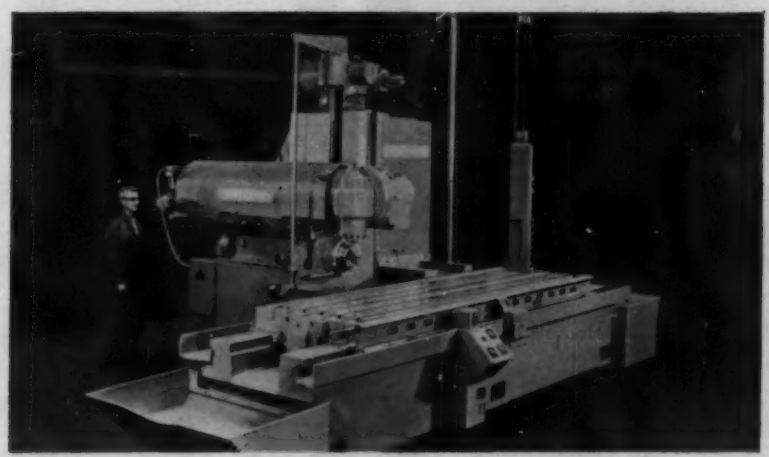
Kent-Owens Machine Co, Toledo, Ohio—Booth 547

MORE DATA? Circle 194, inside back cover



NO. 2 UNIVERSAL MILLING MACHINE — also available in plain and vertical models and for sliding-head Rangemasters—comes in 3, 5, and 10 hp capacities. By using building-block design for standard and special components, five-week delivery can be promised (AM/MM—Aug. 8 '60), p124)—*Brown & Sharpe Mfg Co, Providence, RI*—Booth 452

MORE DATA? Circle 193, inside back cover



Universal Miller Has 50-hp Horizontal Spindle, 20-hp All-Angle Spindle

This 50-hp universal bed-type miller offers longitudinal feed of the table, cross-feed of the column, and vertical feed of the head. The motions are powered by motors independent of the spindle motor, thus providing full horse power to the spindle.

The 50-hp horizontal spindle and the 20-hp all-angle spindle make it possible to machine vertical, horizontal, and all-angle faces in one setup. The 20-hp spindle can be power-positioned over the table and manually positioned through 360° in planes parallel and crosswise to the machine table. When not in use, the 20-hp spindle can be retracted to clear the horizontal spindle.

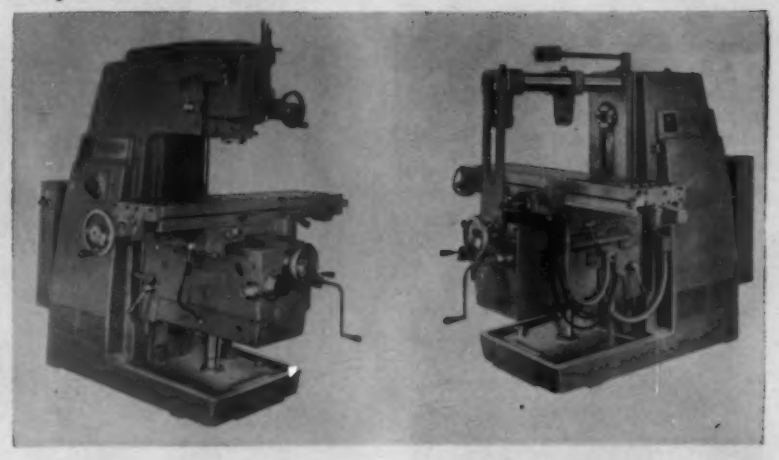
Twenty-four speed changes, from 14—1540 rpm, are available on both spindles. The horsepower range on the main spindle is 1 hp per rpm up to 50 hp maximum; on the all-angle spindle, ½ hp per rpm up to 20 hp maximum.

All feeds and speeds are controlled by pushbutton from the movable pendant. The machine is adaptable to numerical control.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 195, inside back cover

K&T 7½-hp Millers Available in Two Styles



The 307-S12 milling machines are available as plain knee-type milling machines with automatic cycling of the table (right), or as vertical knee-type millers with standard table cycle control (left).

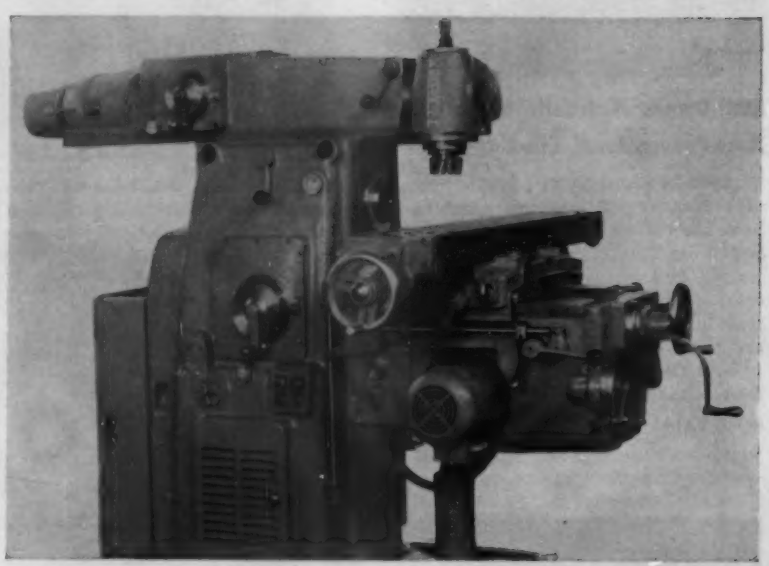
Both machines feature a 7½-hp spindle motor that provides 24 speed changes ranging from 30-2400 rpm. Speed changes are made through a single convenient dial.

Knee, saddle, and table movements of the plain miller are powered by a separate high-torque motor providing 16 feed rates from ¼-32 ipm.

Kearney & Trecker Corp, Milwaukee 14, Wis—Booth 1008

MORE DATA? Circle 196, inside back cover

Kempsmith Miller Has Choice Of Two Head Attachments



The completely new feature of the Master-Mill, a motorized ram, comes with vertical and/or universal head attachments to adapt the machine to angular, multiple-surface, vertical, and horizontal milling.

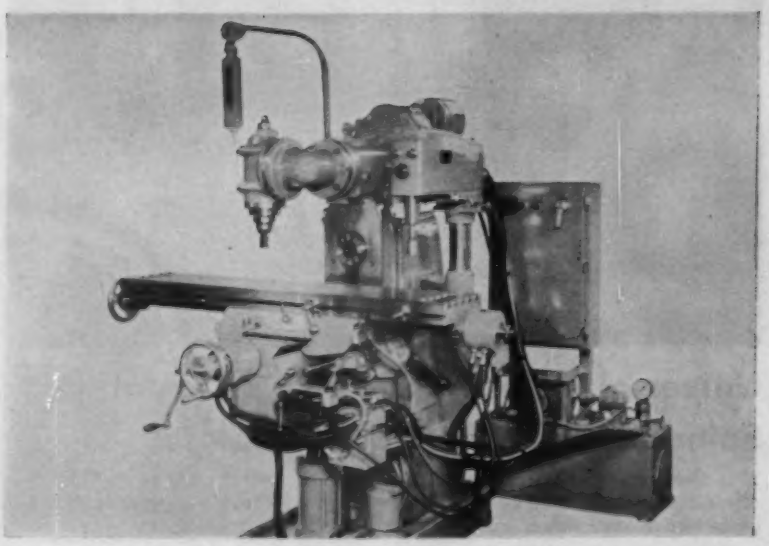
The ram, which can be adapted to any Master-Mill in the field, is driven by a 3 hp motor which has electrical controls at front and rear of the machine. With new electrical control circuits, the head and spindle may be run separately, or interlocked for tandem operation.

Eight speeds, in the range of 50—2250 rpm, may be selected on a dial-type mechanism.

Kempsmith Machine Co, Milwaukee 14, Wis—Booth 347

MORE DATA? Circle 197, inside back cover

Scan-O-Matic Tracer Attachment Controls Heavy-Duty Miller



The Scan-O-Matic milling machine consists of the company's Model 2H heavy-duty miller and the Scan-O-Matic tracer system. The tracing stylus automatically follows the contour of the master regardless of whether it has straight walls, angles, or curves to be cut.

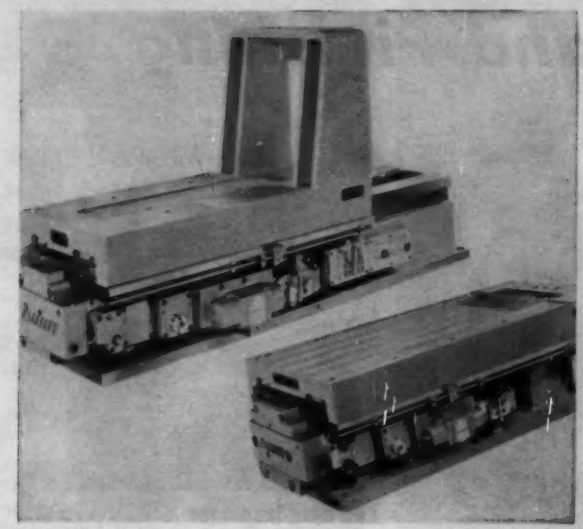
Adjustable stops, operable from either from table saddle motion or knee motion, trip the table reversing valve at the end of each stroke and at the same time an indexing motor crossfeeds the work for a new cut.

Greaves Machine Tool Div, J A Fay & Egan Co, Cincinnati 2, Ohio—Booth 4139

MORE DATA? Circle 198, inside back cover

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Special Machines



Way-Type Feed Units Built to Special Standards

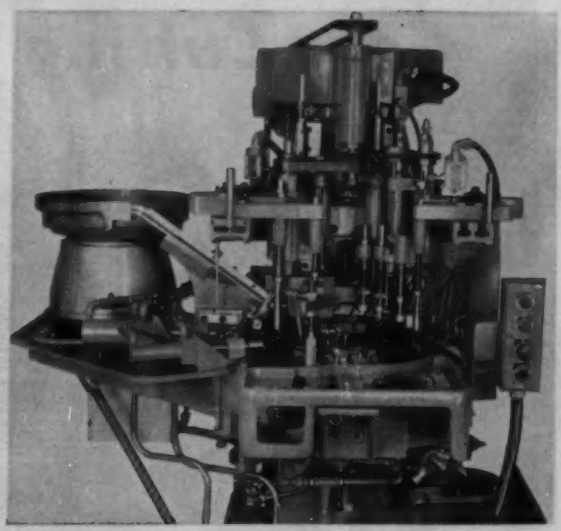
Designed for building-block construction of special machine, these way-type feed units are built to the new special-machine-tool standards. (These standards cover such factors as the mounting and attaching surfaces of main bases, wing bases, feed units, horizontal angular adapters, angular columns, and the bolting patterns of these units, as well as work loading height.) Special machines built to these new standards will be on display.

In addition to meeting these standards, the new way-type feed units provide a 60% increase in the rapid traverse rate, a compact hydraulic power package, and a 50% increase in structural strength. Only three hydraulic lines are required between tank and unit.

Other features include removable hydraulic cylinder, values and manifold components that are interchangeable with feed units of other sizes, panel-mounted controls, and plug-in limit switches.

Buhr Machine Tool Co, Ann Arbor, Mich—Booth 1440

MORE DATA? Circle 199, inside back cover



MODEL 41-20 MACHINE, tooled to produce squeeze type B-X connectors, is a "special" machine produced from standard units. The machine, running at 25 strokes per minute, performs 8,750 operations and completes 1,250 pieces in a 50-min hour—*The Bodine Corp, 317 Mountain Grove St, Bridgeport 5, Conn*—Booth 828

MORE DATA? Circle 201, inside back cover

618 MICROMASTER automatically wafers materials such as germanium, and quartz crystals with parallel accuracy to 0.0001 in. and consistently repeats in size to 0.0002 in. (AM/MM—Apr 18 '60, p146)—*Brown & Sharpe Mfg Co, Providence 1, RI*—Booth 452

MORE DATA? Circle 200, inside back cover

Sheffield Ultrasonic Machines

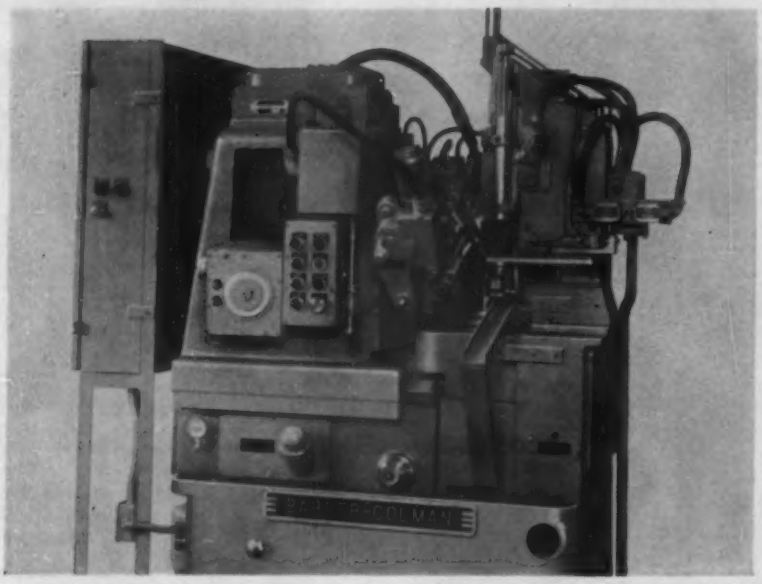
Three machines feature automatic tuning that senses tool wear and compensates, an indicating light that monitors cutting action, and 6 x 8-in. table motions. Model 200-B2 (illustrated) will machine an area of 1/64 to ½ in.

Sheffield Corp, Dayton, Ohio—Booth 381

MORE DATA? Circle 202, inside back cover

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Gear Cutting and Finishing



Barber-Colman Vertical Hobber Cycles Automatically, Gives Long Hob Life

This No. 4-6 vertical gear hobber is designed for either small-lot or high-volume production. The standard machine features automatic cycling, including carriage feed, retraction after cut, and rapid carriage traverse to the starting position, and is designed specifically to be tooled for automatic loading. Its ease of setup and operation, however, adapt it to manual loading of small-lot jobs.

Maximum capacity is 4-in. diameter by 6-in. face width. Maximum hob speed is 614 rpm, and maximum feed is 0.150 ipr. An automatic hob shifter provides even hob wear for maximum hob life. Hobs of longer than standard size can be used to reduce the number of hob changes.

Barber-Colman Co, Machine Tool Div, Rockford, Ill—Booth 923

MORE DATA? Circle 203, inside back cover

Red Ring Inspector Checks Gear Shaving Cutters

This Model PCB involute checker has been developed to provide the high order of precision and repeatability necessary for the checking of gear shaving cutters. It is limited to checking cutters in a range of base circle diameters from 5-13 in.

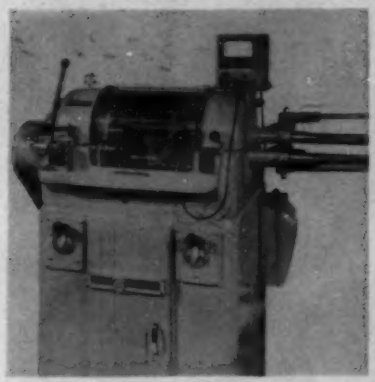
Machine measures from a base circle. It has two dial indicators, one for checking each side of the cutter teeth. The contact finger of the instrument is adjustable through 180°. Free movement of the finger traces a true involute as the indicator slide straightedge is rolled against the base circle. Deviations in this trace profile are measured as finger sweeps.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich—Booth 1430

MORE DATA? Circle 204, inside back cover

EXHIBITORS SHOWING GEAR CUTTING AND FINISHING EQUIPMENT

BOOTH	EXHIBITOR
923	Barber-Colman Co Rockford, Ill
642	Cleveland Hobbing & Machine Company, Div of Textron, Inc Cleveland 17, Ohio
486	The Hamilton Tool Co Hamilton, Ohio
481	The Lees-Bradner Co Cleveland 11, Ohio
945	Michigan Tool Co Detroit 12, Mich
1430	National Broad & Machine Co Detroit 13, Mich
651	Norton Co Worcester 6, Mass



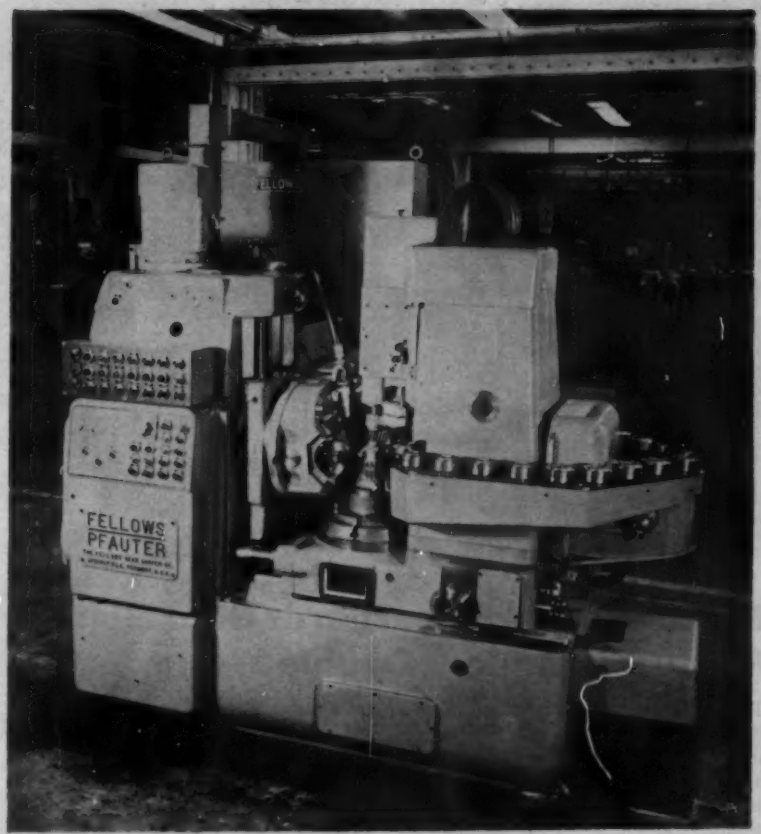
Red Ring Gear Speeder Checks Sound Characteristics of Gears

Model GSC-10-in. gear speeder is equipped with a microphone, broadband amplifier, and a meter in place of the usual horn unit, to simplify and standardize the checking of production gears for sound characteristics.

The machine greatly reduces operator inconsistencies and is suited for low or semi-mass production operations. To set up machine, a satisfactory gear is run and the meter adjusted to read a certain amount for this sound level. All further sets to be checked can then be judged against this satisfactory reading.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich—Booth 1430

MORE DATA? Circle 205, inside back cover



FELLOWS-PFAUTER P 400 HOBBER is the first US-built unit of this design. It is equipped for automatic gear loading and unloading—*Fellows Gear Shaper Co, Springfield, Vt*—Booth 929 MORE DATA? Circle 207, inside back cover

Cleveland Machine Finishes Gears After Heat-Treating, Hardening

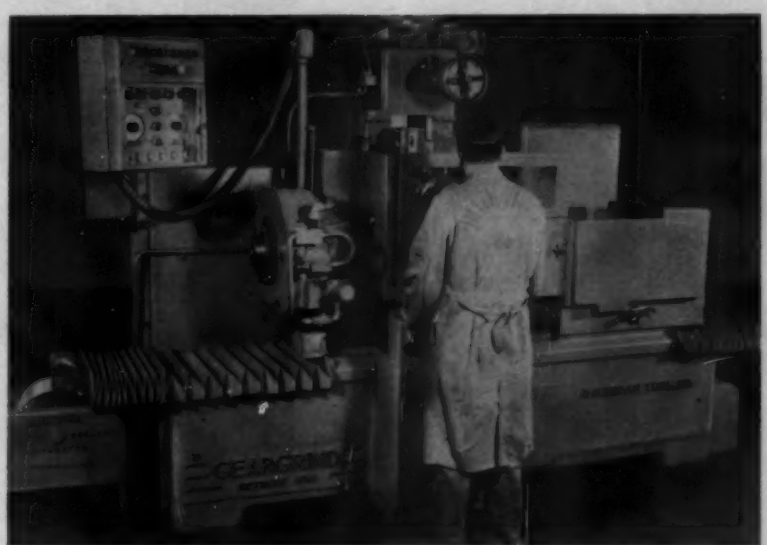
A new gear finishing machine uses high frequency oscillations to finish gears after heat-treating and hardening. These oscillations produce a reciprocating motion which, combined with slow rotation, will finish hardened gears.

The Hard Tooth Finishing Machine not only removes nicks and burrs, it also corrects lead, involute, and other geometry of the gear tooth. It will finish any type of spur or helical gears and provides straight or crown finishing, adjustable from 0—0.005 in. of crown per in. of gear face width.

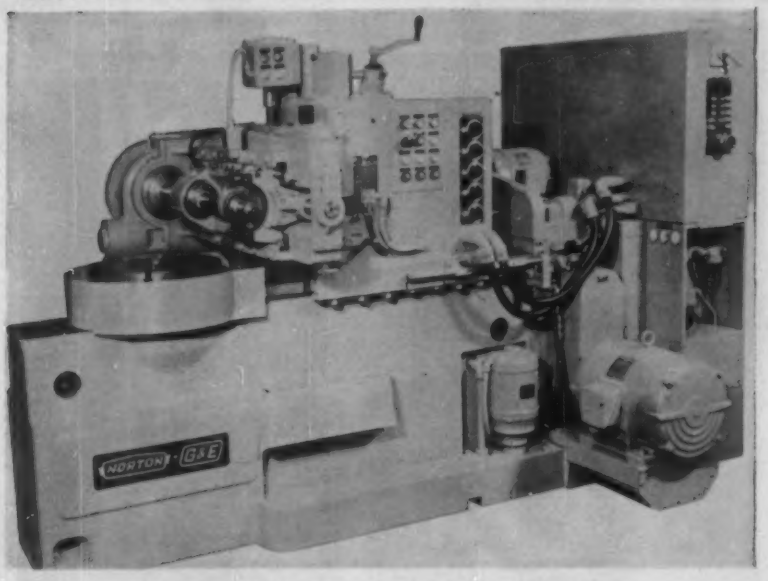
Single- and multiple-spindle models are available for finishing hardened gears of nearly all sizes with or without automatic loading.

Cleveland Hobbing & Machine Co, Div of Textron, Inc, 1311 Chardon Rd, Cleveland 17, Ohio—Booth 642

MORE DATA? Circle 206, inside back cover



NEW MODEL CGG 16X18FA CROWNING GEAR GRINDER is fully automatic, including the wheel dressing cycle. After a rough grind cycle is complete, the gear is automatically semi-finished and/or finish ground, with all grinding rates preset—*Gear Grinding Machines Div, Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*—Booth 945 MORE DATA? Circle 208, inside back cover



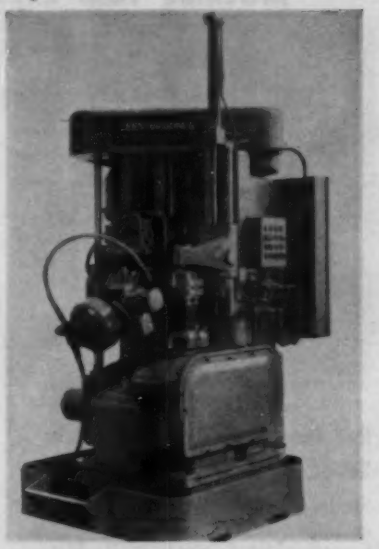
Norton-Gould & Eberhardt Gear Hobber Produces Single & Double Worms

Tangential worm-gear hobbing machine, 20 TWG, cuts gears up to 3-in. circular pitch. The machine is also suitable for flycutting with carbide-tipped tools. The equipment is economical for small-lot production.

The machines are available with automatic cycle, infeed, tangential, or combination infeed and tangential at preselected variable speeds. Infeed hobbing is faster for single-thread worms; tangential hobbing, right or left hand, produces highest-quality multiple-thread worm gears. Combination feed is applied for tapered hobs working on multiple-thread worm gears.

Norton Co, Worcester 6, Mass—Booth 651

MORE DATA? Circle 209, inside back cover



Lees-Bradner Hobbing Machine Handles Gears up to 12-in. Dia

Model 12HD 12 x 20-in. single spindle vertical production hobbing machine has been designed to hob larger and heavier gears up to 12-in. diameter. The machine operates at production feeds and speeds with a precision formerly possible only in cutting smaller gears.

Basically, except for size and capacity, this new machine embodies all the exclusive features of the Model 7 HD vertical production hobbing machine. A newly designed hob head has been developed for both of these machines.

Besides the standard features, company also offers a lead-differential mechanism—a 3½-in. electric hob shifter called Dial-It. Available also is a variable-speed drive unit, using alternating current. Various types of work-holding fixtures are adaptable to this machine.

The Lees-Bradner Co, Cleveland 11, Ohio—Booth 481

MORE DATA? Circle 210, inside back cover

LINE OF ROTARY GEAR SHAVERS, the 870 Mark II, consists of three types of machines — underpass, internal, and universal—in three sizes to handle gears up to 8, 12, and 18 in. dia and up to 12 in. dia for internal gears (AM/MM—May 30 '60, p114)—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*—Booth 945

MORE DATA? Circle 211, inside back cover

Red Ring 24-in. Rotary Gear Shaver Has No Knee, Permits Easy Loading

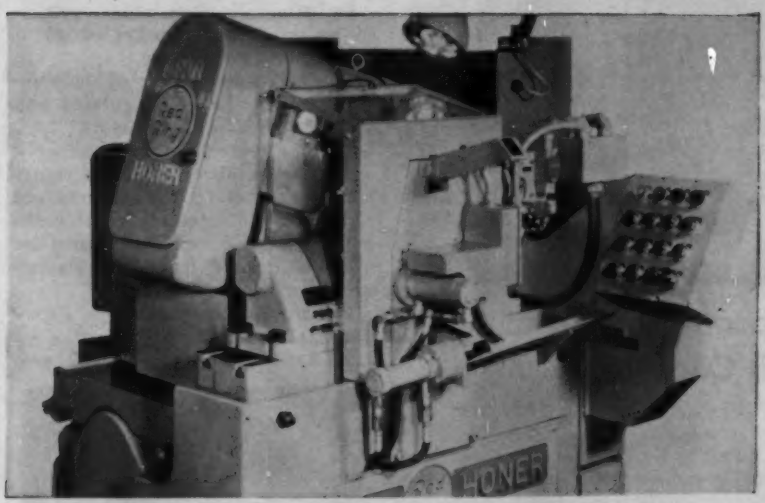
Model GCX-24-in. rotary gear shaver features a tunnel-type column design that is combined with an extended base. A deep worktable can be moved out from shaving position under the shaving cutter to permit easy loading and unloading of the work gear in an area unrestricted by machine component interference.

Of all-cast-iron construction, the machine has no knee. Cutter feeds down for shaving and is provided with rapid-traverse up-and-down feed.

This shaver handles work from 3 to 24-in. PD in the 2 to 16 DP range. A maximum of 36½ in. between centers is provided on the worktable. The table has a 10-in. stroke without crowning, an 8-in. stroke with crowning. The work drives the cutter, which is above the work so that chips fall away from the cutting area. An automatic up-and-down feed is optional equipment.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich —Booth 1430

MORE DATA? Circle 212, inside back cover



Gear-Tooth Honing Machine Offers Four Separate Honing Techniques

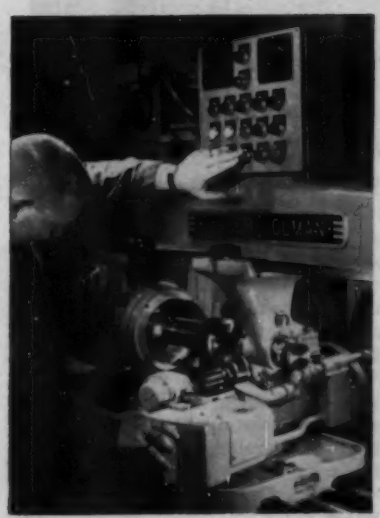
Model GHD-12-in. gear-tooth honer can process hardened gears in four different ways; (1) honing with backlash in conjunction with a locked honing head, (2) zero-backlash operation wtih precision pressure control in conjunction with locked honing head, (3) constant-pressure operation with automatic mechanical wedge-type backup eliminator, and (4) constant-pressure operation wtih overload relief provided by an adjustable leaf spring backup protector.

Machine is made in either semi-automatic or fully automatic types, the difference being the loading method. Gears from 4 to 20 DP ranging in size from 1 to 12 in. can be honed on the machine. Maximum distance between centers is 10¼ in. Cutter head stroke is 5½ in. maximum.

The machine to be exhibited will be equipped with an automatic loader for honing small helical pinions.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich —Booth 1430

MORE DATA? Circle 214, inside back cover



Standard Gear-Hobbing Machine Has Preselected Work Cycles

"Multicycle" 16-16 Barber-Colman gear hobber has automatic control for all hob-carriage and workslide functions, and features three different preselected work cycles.

Vertical feed produces worm gears in addition to spur and helical gears and splines. Power feed horizontally and vertically cuts total machine time.

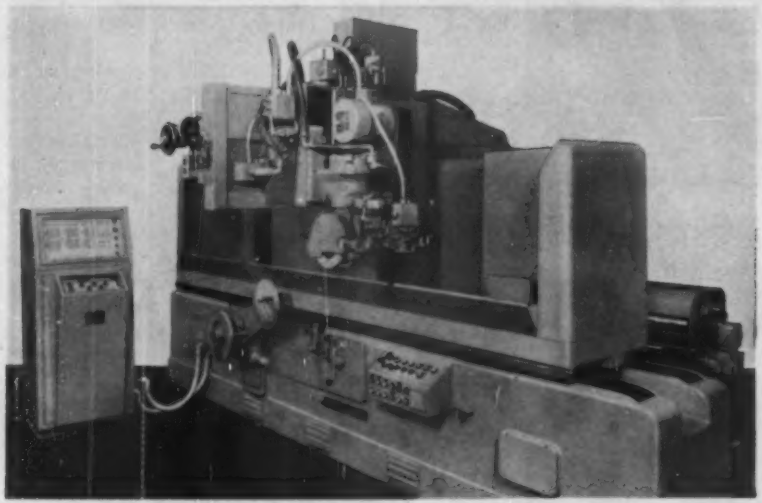
Of the three cycles, the square cycle is standard, with rapid vertical positioning and horizontal return of the hob carriage. The plunge cycle has variable downfeed. The plunge-approach cycle is a combination. Control is by cam.

Barber-Colman Co, Machine Tool Div, Rockford, Ill—Booth 923

MORE DATA? Circle 213, inside back cover

MMT=PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

Grinding, Honing, Lapping



Tape-Controlled Thompson Grinder Grinds Continuous-Path Contours

Type C Tapeforming grinder, 14x28x 60-in., is designed for grinding continuous path contours in both vertical and horizontal planes. Wheelhead has a travel of 10 in. in both planes.

The numerical control consists of a Thompson-Ramo-Wooldridge Director System utilizing 8-channel punched tape. This provides numerical control to three axes, of which two axes are selective.

The punched tape uses transistorized module-construction.

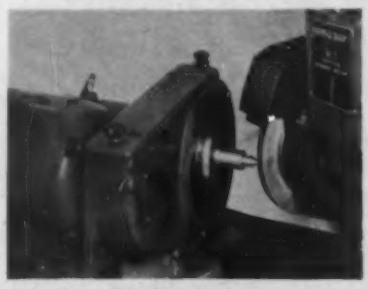
Grinder is equipped with a 5-hp wheelhead motor using a 14x2x5-in. grinding wheel. A variable-speed control on the wheel spindle motor automatically changes spindle speed from the dresser position to maintain a constant peripheral wheel speed. The wheel head spindle can be rotated in the horizontal plane to permit templet grinding with a large-diameter wheel.

Other features include a Hoglund head-mounted hydraulic wheel truer with a preselected dressing cycle and automatic compensation, automatic lubrication system, and bed way covers.

This system includes the bed and table, saddle, and column. Tape bed way covers are standard.

Thompson Grinder Co, Springfield, Ohio—Booth 850

MORE DATA? Circle 215, inside back cover



Grinding Headstock Runs True Within 5 Millionths

A headstock spindle that will actually run true within 5 millionths and produce end camming errors of less than 10 millionths is possible through use of hydrostatic bearings. With these bearings the spindle is floated on opposed pads or pockets of high-pressure oil. The slightest off-axis movement builds up pressure in one pocket and reduces it in the opposed pocket. The fast build up of force opposes off-axis movement and limits it to millionths of an inch.

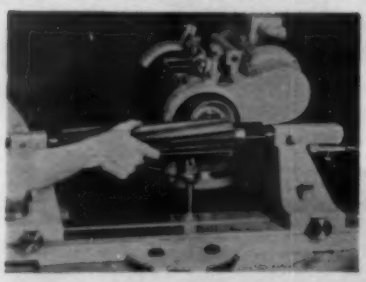
End camming is likewise restricted by an annular pocket of oil at each end of the spindle.

Successful application of the principle requires a well-regulated and filtered source of oil pressure.

Carbide centers for precision work can be ground on the live-center headstock, and the guaranteed roundness tolerance of 10 millionths held. The headstock is designed for use with the No. 1 and 2 series universal grinders.

Brown & Sharpe Mfg Co, Providence, R.I.—Booth 452

MORE DATA? Circle 216, inside back cover



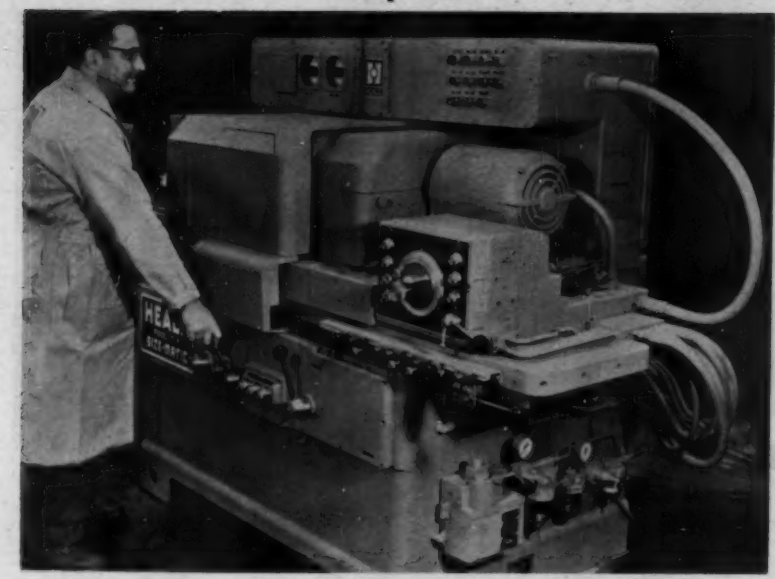
Norton Tool & Cutter Grinder Shows Clearance Angle on Scale

No. 200 Norton cutter and tool grinder is designed for all toolroom use; and includes fast clearance-angle setting with a tilting wheelhead, a tooth rest that remains on center, and quick taper setting with gage blocks.

The machine has wheel slide to keep grinding action always within the area of the rigid base. The wheelhead is mounted eccentrically to allow maximum swing when required.

Norton Co, Worcester 6, Mass—Booth 651

MORE DATA? Circle 217, inside back cover



Heald Internal Grinder Has Wheelhead on Crosspiece

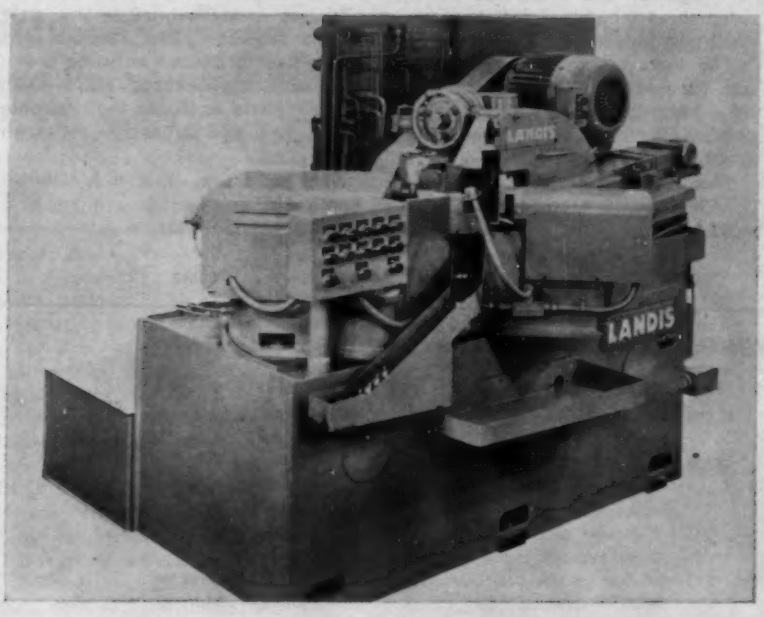
Model 171A has a workswing to 8-in. OD and 90° included angle. Because the wheelhead is mounted on cross slide and fed into work, this new internal grinder takes heavier roughing cuts and has faster more accurate feeds than previous models. Constant plus impulse feed, which advances wheel only at reversals of the table, provides improved finish and straightness on long bore-to-diameter ratio parts.

The grinder has infinitely variable compensation for wheel wear (0—0.004 in.); therefore, it has longer wheel life and improved tolerance control. Hydraulic power and lube oil units are located outside of the machine base to prevent thermal distortion.

The 171A is available in Size-Matic, Gage-Matic, or plain models.

The Heald Machine Co, 13 New Bond St, Worcester 6, Mass—Booth 924

MORE DATA? Circle 218, inside back cover



Landis Chucking Grinder, Type R Finishes Diameters and Faces Together

Chuckable workpieces, such as bevel gears, can be ground on hub diameter and back gear-tooth face with minimum setup time by Type R Landis chucking grinder. Faces, outside diameters, radii, and tapers also can be ground singly or combined.

The machine has flat and V-ways, and is equipped for rapid feed, slow grinding feed, and sparkout. Rapid advance is adjustable from 3.4 to 2 in. Grinding feed ranges up to 0.082 in. on diameter.

Truform dresser attachment will produce up to 90° corners. Normal wheel size is 24 in. OD with width up to 4 in. The machine includes isolated hydraulic power, and attachments for chucking and loading.

Landis Tool Co, Waynesboro, Pa—Booth 823

MORE DATA? Circle 219, inside back cover

Two Norton Surface Grinders Have Complete Hand Control

Type TS hand grinder is in two sizes, 10 x 16 in. and 6 x 12 in., for small, short jobs in the toolroom. They have 7-in. and 12-in. wheels, and have two-speed vertical feed calibrated to 0.0001 in. Parts as high as 12 in. may be ground.

Both sliding table and saddle are on antifriction bearings, and a sliding table lock is provided for wheel truing.

Norton Co, Worcester 6, Mass—Booth 651

MORE DATA? Circle 220, inside back cover

Hill Acme 2-Roll Vertical Abrasive Belt Machine Grinds and Polishes Sheets

This hydraulic table type "sheet" machine is built for grinding and polishing of sheets in flat form to very fine finishes. Its basic parts, all of which are mounted on a heavy welded, fabricated steel base, are a top steel idler roll and a lower rubber-covered contact roll. The abrasive belt travels over these two rolls.

Underneath the contact roll is the billy, or pressure roll, which is actuated vertically by means of two air cylinders located in the front and back of the machine base. This roll exerts the necessary grinding pressure against the underside of the rider sheet which carries the material being processed.

The low pressure hydraulic system for table movement is operated by a vane-type rotary pump which provides variable table speeds from 10-60 fpm.

The Hill Acme Co, 1201 W 65th St, Cleveland 2, Ohio—Booth 1240

MORE DATA? Circle 221, inside back cover

Sheffield Model 122 Micro-Form Grinder Works from Drawing

Optical vernier unit on this cam and templet grinder allows operator to read table position to 0.0001 in., laterally or longitudinally—no gage blocks required. The operator can work directly from a print or drawing, producing flat work up to 4 in.

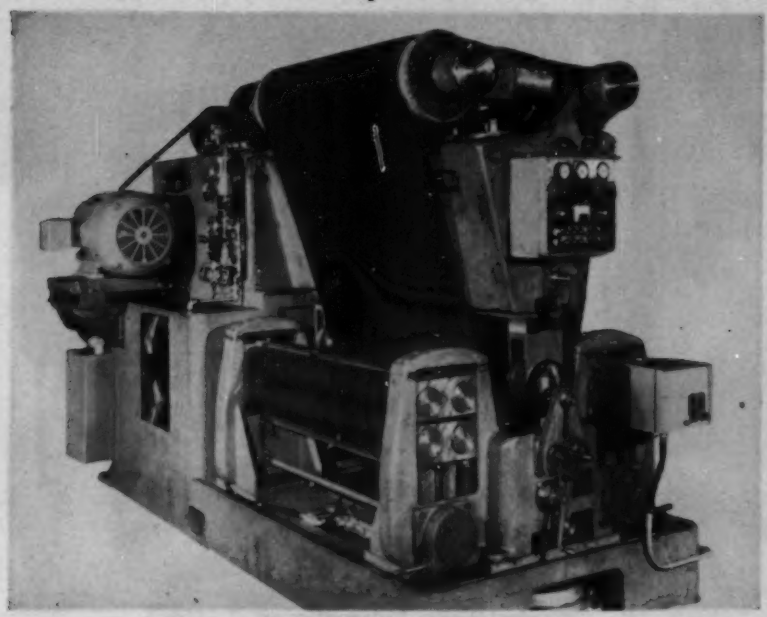
Such parts as form tools, profile gages, dies, and Crushtrue rolls can be ground.

Sheffield Corp, Dayton 1, Ohio—Booth 201

MORE DATA? Circle 222, inside back cover

EXHIBITORS SHOWING GRINDING, HONING, LAPPING EQUIPMENT

BOOTH	EXHIBITOR
1120	American Gage & Machine Co Size Control & Walsh Press & Die Divisions Chicago, Ill
152	Barnes Drill Co Rockford, Ill
251	Besly-Welles Corp South Beloit, Ill
1209	The Blanchard Machine Co Cambridge 39, Mass
452	Brown & Sharpe Mfg Co Providence, R I
936	Bryant Checking Grinder Co Springfield, Vt
934	Cincinnati Lathe & Tool Co Cincinnati 9, Ohio
1034	The Cincinnati Milling Machine Co, Machine Tool Division Cincinnati 9, Ohio
431	DeVlieg Machine Company Royal Oak, Michgan
745	The Eastern Machine Screw Corp New Haven 6, Conn
946	Ex-Cell-O Corporaton Detroit 32, Michigan
800	Fosdick Machine Tool Company Cincinnati 23, Ohio
1220	Frauenthal Div, the Kaydon Engineering Corp Muskegon, Michigan
751	Gallmeyer & Livingston Co Grand Rapids 2, Michigan
811	Gardner Machine Company Beloit, Wisconsin
1042	Gisholt Machine Company Madison 10, Wisconsin
924	The Heald Machine Co Worcester 6, Mass
1240	The Hill Acme Co Cleveland 2, Ohio
823, 825	Landis Tool Co Waynesboro, Penn
1229	The Lapointe Machine Tool Co Hudson, Mass
1206	Mattison Machine Works Rockford, Ill
945	Michigan Tool Co Detroit 12, Mich
1225	Micromatic Hone Corp Detroit 38, Mich
1205	National Automatic Tool Co, Inc Richmond, Ind
651	Norton Co Worcester 6, Mass
342	Oliver Instrument Co Adrian, Mich
1136	Parker-Majestic Inc Detroit 7, Mich
1210	Rivett Lathe & Grinder, Inc Brighton, Boston 35, Mass
201	The Sheffield Corp Dayton 1, Ohio
1120	Size Control Div of American Gage & Machine Co Chicago, Ill
1014	Sundstrand Machine Tool Co Rockford, Ill
1426	The Taft-Peirce Manufacturing Co Woonsocket, R I
351	Van Norman Machine Co, Div of Van Norman Industries, Inc Springfield 7, Mass



Mattison Compact Abrasive Belt Grinding And Polishing Machine Has 3-Roll Head

No. 457 grinder has the compactness needed today for in-line installations, such as for coil grinding, without loss of rigidity, cutting qualities, or the power needed for production of accurate fine-finish work.

The three-roll design gives a smooth surface finish which is free of motor pulsations and chatter marks: The contact roll supplies the grinding or polishing action; another roll aligns and flexes the belt; and a third roll drives the belt, pulling it between the work and the contact roll.

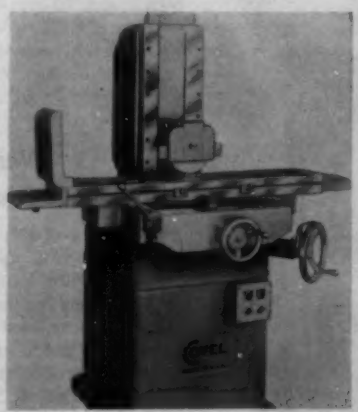
Other special functions of the three-roll head are: automatic tensioning and tracking of 14-ft belts which provide more time for cooling, yet are easy to replace; new manual control instantly switches billy roll to floating or fixed position; closer pinch roll spacing allows shorter work grinding. Grinding contact is established within only ¼-in. of a sheet's lead edge: A photoelectric cell senses the leading edge of a sheet as it enters through the feed rolls, and actuates a control mechanism which raises the billy roll and brings the sheet into contact with the abrasive belt.

The new three-roll head—including rolls, belt, tracking and tensioning devices, and electronic timer—is designed as a unit which can be used on pinch roll machines, reciprocating table machines, conveyor-type applications, and way and column combinations. The design adapts to both wet and dry grinding, with large windowed doors allowing easy access to all functional parts.

Belt widths are 36, 48, 60, and 72 in. All operating controls are located at the front of machine within easy reach of operator.

Mattison Machine Works, Blackhawk Park Ave, Rockford, Ill—Booth 1206

MORE DATA? Circle 223, inside back cover



Covel Surface Grinder Features "Power Steering" Type Control

To reduce operator effort and still retain the advantages of quick set for one piece and short run jobs, Covel has introduced a hydraulic type control very similar to the power steering used in automobiles. This 6 x 18-in. surface grinder is set up exactly the same way as a conventional hand feed machine.

A lever, located in the same position as the usual handwheel, controls table speed and reversal. With a slight touch to the left the table moves in that direction and reverses with an easy movement of the lever to the right. The operator can slow the table to a crawl for positioning.

Grinding time is reduced over straight hand feed machines because handling time remains the same and grinding speed is almost twice the amount consistently obtained by hand.

Covel Mfg Co, Benton Harbor, Mich—Booth 332

MORE DATA? Circle 224, inside back cover

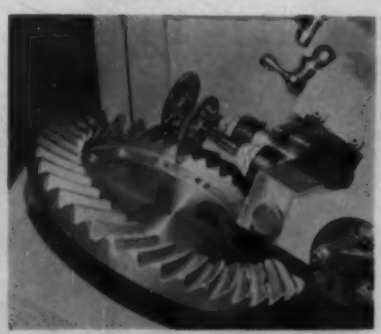
Eastern Displays, Demonstrates New Loungway Belt Grinder

Eastern recently acquired the complete facilities and product line of Abrasive Machinery Co, and will display and demonstrate a new Loungway machine at the Show. This new belt grinder will be manufactured and distributed as one of Eastern's new products.

They will also display a H & G threading machine equipped with five chaser insert type die head.

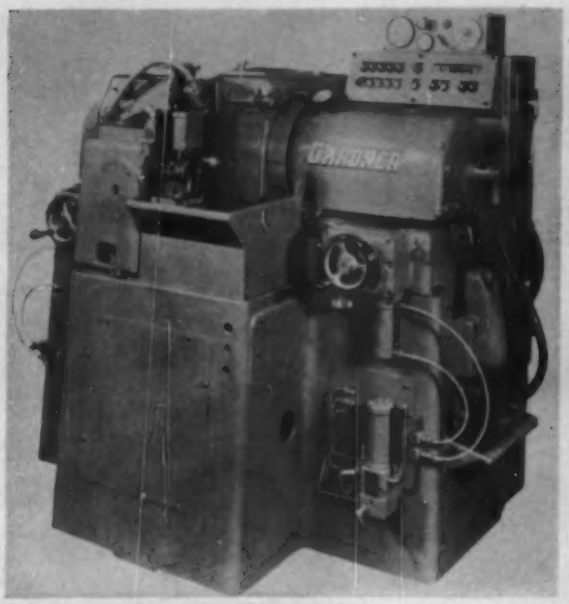
Eastern Machine Screw Corp, New Haven, Conn—Booth 745

MORE DATA? Circle 225, inside back cover



TWIN-SPINDLE AUTOMATIC high speed grinder simultaneously deburrs and chamfers entire contour of both end of teeth on spur, helical, or bevel gears. Grinder wheels run at 17,000 rpm; standard machine will handle gears from 3—13 in. (AM/MM—Feb 8, '60, p156)—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*—Booth 945

MORE DATA? Circle 226, inside back cover



Double-Disk Gardner Grinder Surfaces Sides of Small Parts

Gardner 2H10 precision double spindle machine finishes small parts with parallel sides to tolerances within millionths—parallel within 0.000,025 in. and to uniformity of 0.000,075 in. Ultra-fine power feed of 0.000,025 in. is available; maximum feed is 0.00015 in., and is fully automatic under air power and electrical control.

Purpose of the machine is to grind flat faces on instrument-bearing races, which are transferred in a rotary carrier from a vibratory bowl, then automatically ejected after processing. Rate is 5000-6000/hr.

Gardner Machine Co, Beloit, Wis—Booth 811

MORE DATA? Circle 227, inside back cover

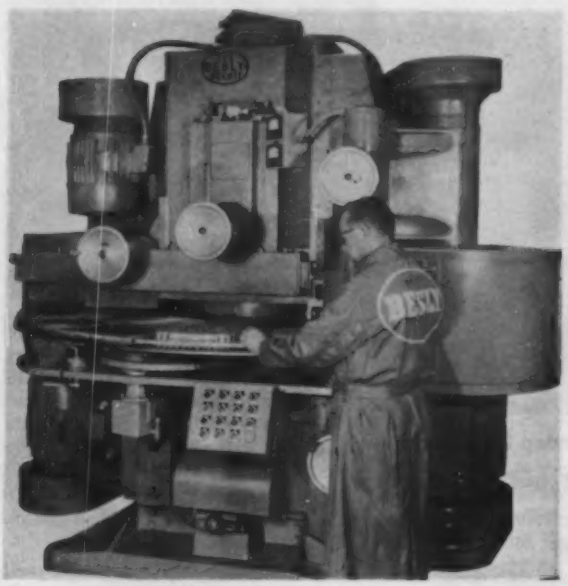
Control Fully Automatic on Ex-Cell-O Groove Grinder

Model 973 precision groove grinder has variable wheel feed, sparkout, and withdrawal controlled by positive cam action, and hydraulically operated cross-slide movements. The machine automatically plunge grinds single or multiple grooves or forms.

Positive size control is by handwheel graduated in 0.0002- in. increments for cross-slide settings, automatic wheel-size compensation, and positive limit stop. The unit will also do roughing work, and will handle a range of diameters.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32—Booth 946

MORE DATA? Circle 228, inside back cover



Besly TV 3 Vertical-Spindle Grinder Finishes Coil Ends Parallel and Flat

Tandem grinder, which can easily be adapted for multiple grinding operations by adding grinding heads, is arranged for simple abrasive disk and tooling changes.

The machine has orbital grinding action due to oscillation of the feedwell as it revolves. The patented action produces more efficient cutting action, longer disk life, and less frequent wheel dressing.

Besly-Welles Corp, South Beloit, Wis—Booth 251

MORE DATA? Circle 229, inside back cover

Natco Honing Machines Do Heavy-Duty Production Honing of Bores

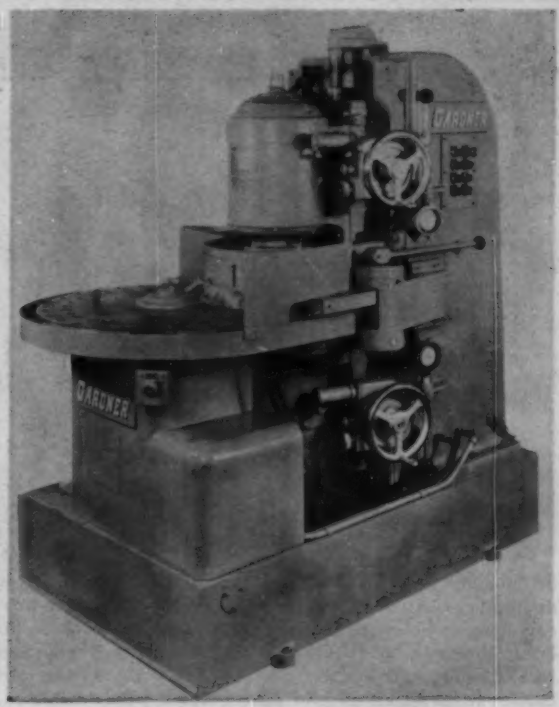
Two new honing machines—one mechanical (shown) and one hydraulic—are both designed for production honing of bores. The mechanical machine will perform round-the-clock production operation on bores up to 3 in. dia and 3 in. long; the hydraulic machine, built for work on larger bores, has a 24 in. stroke and will hone bores up to 7½ in. dia, 9½ in. long. Stroke of the mechanical machine—up to 3 in.—is adjustable in desired increments.

The machines are designed to use Jes-Cal honing tools which have an exclusive, automatic, plug-gage method of size control. The machines may be used singly or as multiple heads on a common base, and can be integrated with other Natco machines into a transfer line.

Pick-off gears, for the widest possible selection of rotational speeds and stroke rates, are standard equipment on the hydraulic machine. It can deliver up to 15 hp at the tool.

National Automatic Tool Co, Inc, Richmond, Ind—Booth 1205

MORE DATA? Circle 230, inside back cover



Gardner Vertical Double-Spindle Grinder Finishes Opposed Faces of Small Parts

Powered increment feed for both heads is a new feature of Model 2V18 grinder, which is equipped with two vertical spindles and two 18-in. abrasive disks. Purpose of the machine is to grind parallel two ends of small parts, which are loaded in a rotary carrier by hand.

A portable control station for the power feed is fitted with a permanent magnet, which allows it to be moved around and clamped to the machine base at any convenient location.

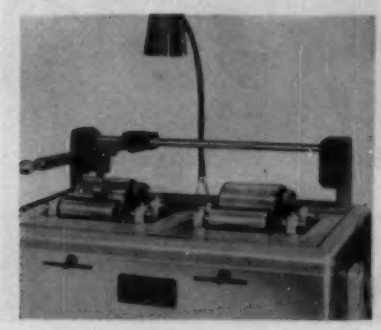
The disks are driven by 10-hp motors. Parts are moved at ⅛ to 1¾ rpm, then dropped into a basket by gravity.

Either head may be advanced in increments of 0.0005 in. to 0.003 in.—handwheels are graduated in increments of 0.0005 in.

At a production rate of 2000 parts/hr, a flatness tolerance of 0.0003 in. and parallelism of 0.0003 to 0.0005 in. can be attained. Stock removal is 0.005 to 0.007 in.

Gardner Machine Co, Beloit, Wis—Booth 811

MORE DATA? Circle 231, inside back cover



Centerless Lapping Machine Redesigned for Lapping Carbides

This centerless lapping machine has been completely redesigned for lapping carbides and other ultra-hard materials. The cabinet will be similar to the standard Model 200, but there are numerous improvements in the mechanism. Rolls can now be adjusted by merely turning a crank which actuates a screw attached to the roll-bearing blocks. This mechanism is self-locking to assure proper roll spacing.

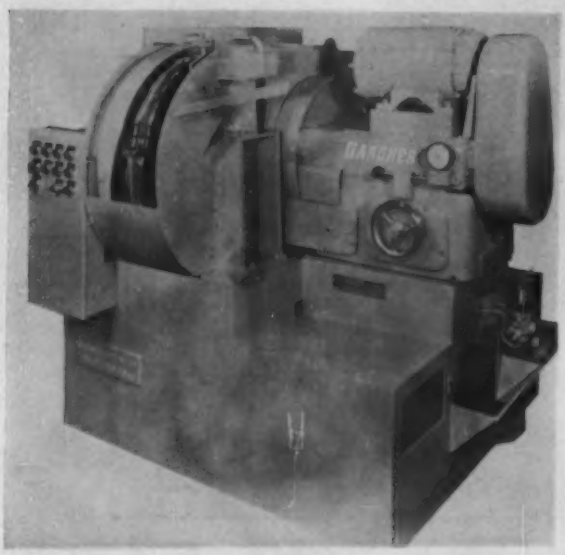
V-belt drive of the rolls minimizes vibration, and the belt tightener has been improved for greater accessibility. The lapping rolls, of course, are entirely new.

A central oiling system and a swing-a-way light are available as optional equipment.

Size Control Co, 2500 W Washington Blvd, Chicago, Ill—Booth 1120

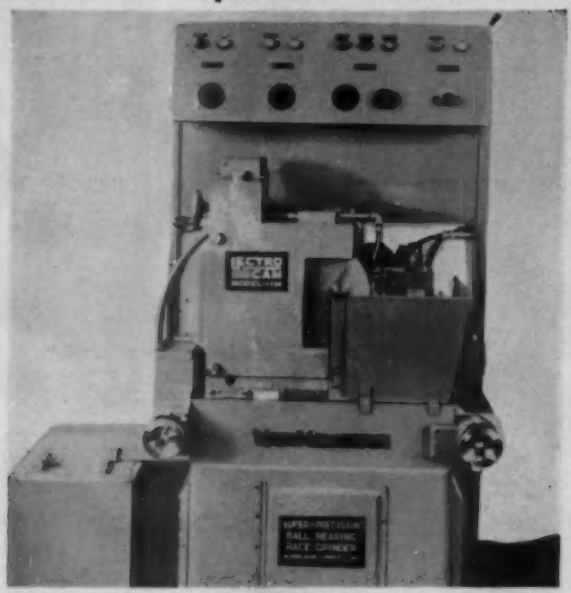
MORE DATA? Circle 232, inside back cover

GRINDING, HONING, LAPPING—Machine Tool Exposition in Print



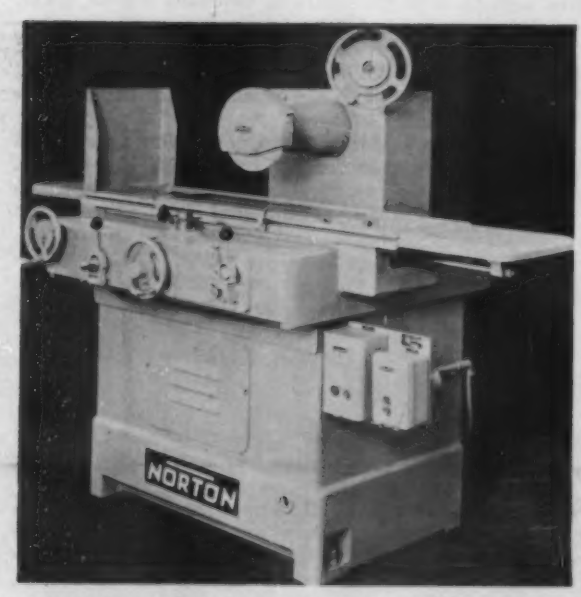
SINGLE-SPINDLE 1H20 GARDNER DISK GRINDER is equipped with automatic loading and unloading, in-process gaging, carrier fixturing, and a new box base to finish the stem ends of auto-engine valves. Production rate is 2400/hr, uniformity is to 0.004 in. for roughing and 0.002 in. for finishing, and squareness is within 0.002 in. tir. The carrier has six parts stations, is actuated by cams, and has reed-mounted workholding clamps.—*Gardner Machine Co, Beloit, Wis*—Booth 811

MORE DATA? Circle 233, inside back cover



BALL-BEARING-RACE GRINDER, the Lectro-Cam Model 1-M, grinds inner races of miniature bearings to tolerances of less than 50 millionths, and to a surface of about 3 or 4 microinches (*AM/MM*—Aug 8 '60, p80). Features include simplified tooling, minimum vibration, exposed grinding, automatic dressing—*Van Norman Machine Co, Springfield, Mass*—Booth 351

MORE DATA? Circle 234, inside back cover

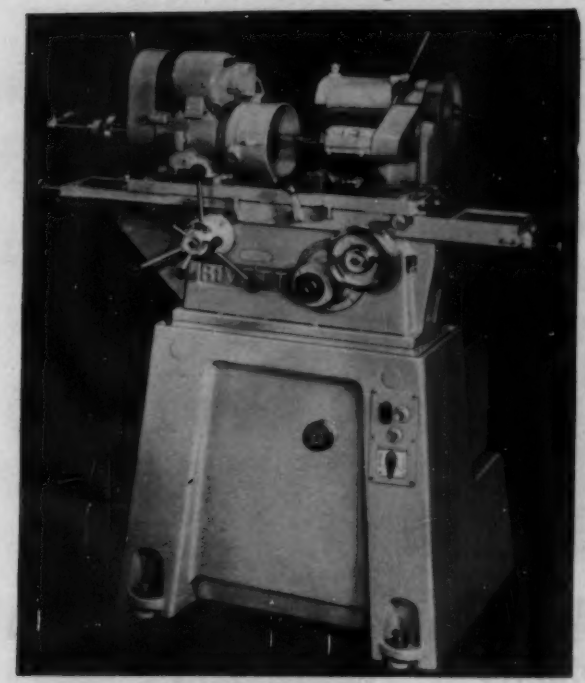


NORTON S-3 HYDRAULIC SURFACE GRINDER is now built in two sizes, 6 x 18 in. and 8 x 24 in. High table speed is 150 fpm; increasing production and reducing heat in the work with no apparent disadvantages. Two-speed vertical feed is calibrated to 0.0001 in. (*AM/MM*—Apr 4 '60, p242) —*Norton Company, Worcester 6, Mass*—Booth 651

MORE DATA? Circle 235, inside back cover

VERTICAL CENTALIGN CAM GRINDER, of unit type construction, permits greatly increased production of contour bores through the operation of eccentric workholding fixture in a horizontal plane—*Bryant Chucking Grinder Co, Springfield, Vt*—Booth 936

MORE DATA? Circle 236, inside back cover

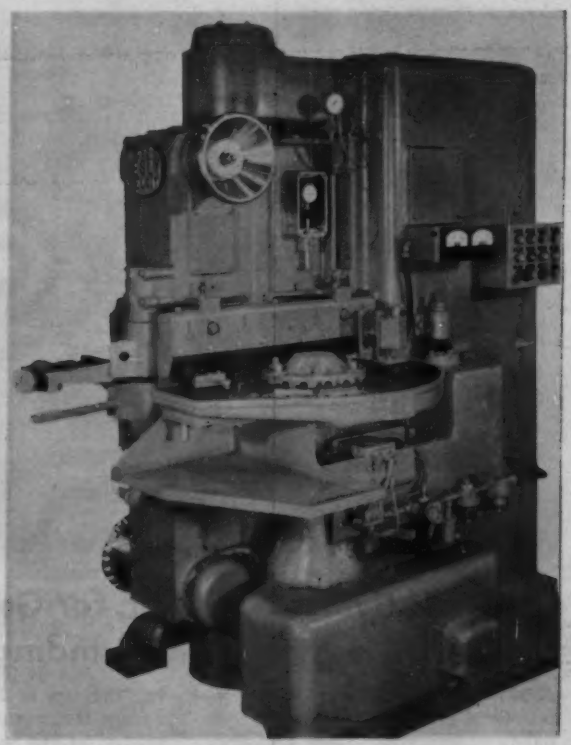


Model 84 Rivett Internal-External Grinder Features Flexibility

Fast setup time is the claim for Rivett Model 84 internal-external grinder, which is equipped with interchangeable wheelheads for two spindles. Hole capacity is 3 in. diameter; OD maximum is 3 in.

Rivett Lathe & Grinder, Inc, Brighton 35, Mass — Booth 1210

MORE DATA? Circle 237, inside back cover



Besly Vertical DV 2 Grinder Offers Automatic Sizing, Fast Setup

This machine is a vertical version of the horizontal grinder by the same company, and has automatic sizing and adaptability to automatic parts loading and unloading. Advantages for this design are easy setup and minimum floor space required.

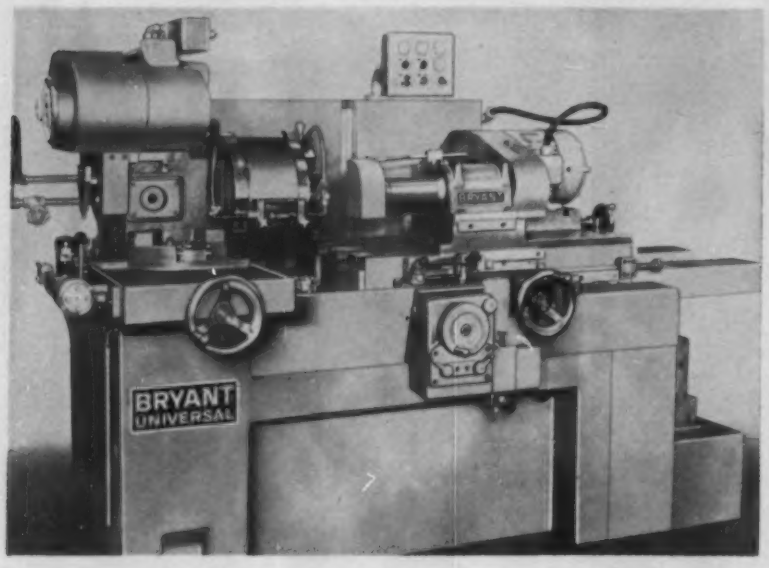
Work is loaded into and exits from the machine at the same height. Independent spindle motors with belt drives permit large spindle bearings. The machine will grind carbides and ceramics as well as conventional metals.

Besly-Welles Corp, South Beloit, Wis—Booth 251

MORE DATA? Circle 238, inside back cover

SLIDER-LAND GRINDER, Sheffield model 121-C, is for high-precision finishing on hydraulic servo-valves, where the edge of the slider land must be controlled in relation to the inside edge of a sleeve port. Two locked-together work tables hold the slider and sleeve, and permit microscopic viewing so the parts can be matched. A 7 x ¼-in. wheel will handle work to a 5-in. dia. Air gaging, viewing screen and dust remover may be added—*Sheffield Corp, Dayton 1, Ohio*—Booth 201

MORE DATA? Circle 239, inside back cover



Bryant Universal Grinder, for General Purpose Use, Has 16-in. Grinding Stroke

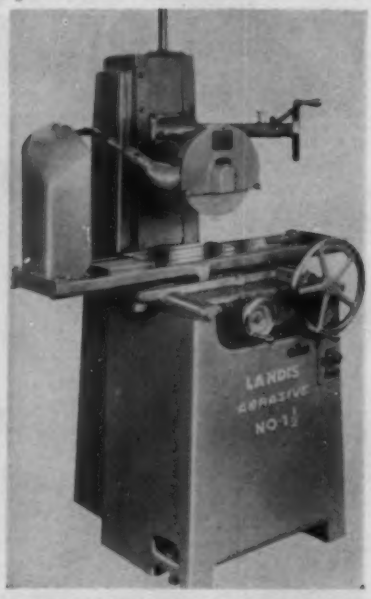
A low-cost, general purpose internal universal grinder—for ID, OD, internal face, and rotary face grinding—this machine has a 12 in. swing inside the standard chuck guard, and a maximum grinding stroke of 16 in.

The machine's compound wheelslide construction places the traverse slide above the cross-slide. The effect of this is to cut reciprocating mass to a minimum, thereby allowing the use of feed controls which do not reciprocate with the traverse motion of the wheelslide.

A complete line of accessories is available. One of these, a micrometer attachment for accurately setting taper, eliminates the need for gage block combinations.

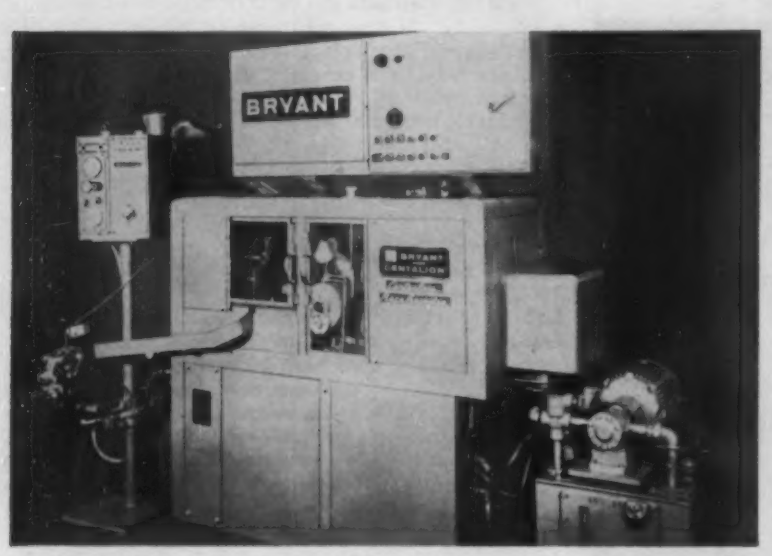
The Bryant Chucking Grinder Co, Springfield, Vt—Booth 936

MORE DATA? Circle 240, inside back cover



IMPROVEMENTS in Landis Abrasive No. 1½ hand-operated surface grinder include heavier bed and column with added ribbing, wheelhead weight taken by ball thrust bearing, extra wide saddle ways, and electrical controls in a recessed compartment. Power is 1 hp at 1750 rpm, or 2 hp may be mounted—*Landis Tool Co, Waynesboro, Pa*—Booth 823

MORE DATA? Circle 241, inside back cover



MODEL C CENTALIGN INTERNAL GRINDER features exclusive Centalign wheelslide construction and cycle control by programming cams. At the Show, shoe centerless tooling for quick changeover from one job to another will be used to handle the tapered roller bearing cones being ground—*Bryant Chucking Grinder Co, Springfield, Vt*—Booth 936 MORE DATA? Circle 242, inside back cover

Norton Multiwheel Grinder Works in Crankshaft Line

Type CM-2 semiautomatic multiwheel grinder replaces type CM-1, and has these advantages:

Wheel changing is faster because motor has been repositioned, and does not have to be moved when wheel is replaced.

Wheel-feed mechanism is improved with feedscrew in tension, rapid-traverse cylinder in front to reduce forces, feedscrew in same plane as the grinding area to reduce deflection, and the wheel-slideways plane closer to the wheel centerline to improve grinding-force stability.

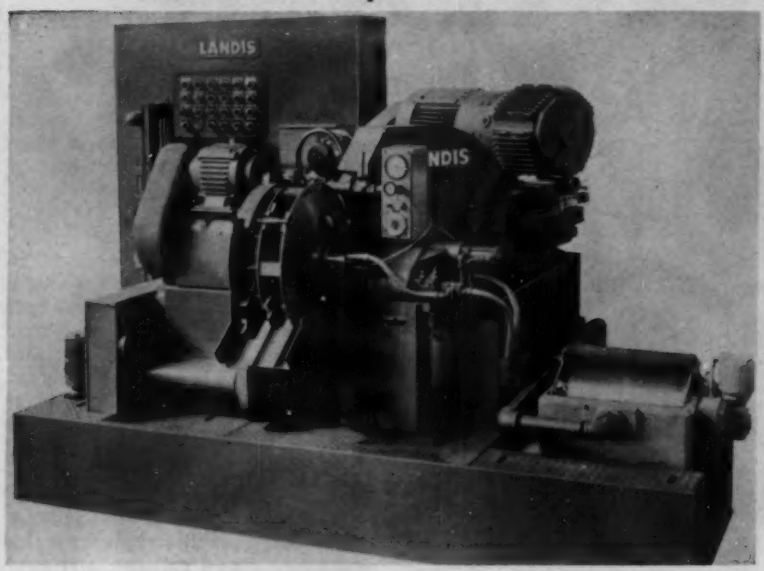
Larger wheels are installed (42-in. instead of 36 in.) for more grinding abrasive and less wheel changing. In addition, the new wheel slide has two flat ways and a guide rail.

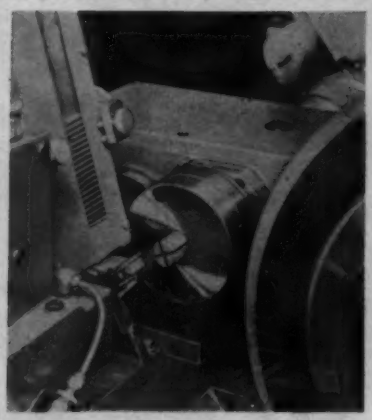
The work table is a fixed machine member for more rigid work support—wheel spindles are moved for endwise adjustment.

Truing devices are at front of the machine for simpler action.

Norton Co, Worcester 6, Mass—Booth 651

MORE DATA? Circle 243, inside back cover





AUTOMATIC THREAD GRINDER, Model F, is designed for high-production thread grinding of small parts. It is particularly applicable to thread grinding operations on all standard taps (illustrated), with manual or automatic handling — *Jones & Lamson Machine Co, Springfield, Vt*—Booth 839

MORE DATA? Circle 245, inside back cover

Landis Plunge Grinder Produces Axles, Finishing Diameters, Faces, and Radii

Type R plunge grinder is for production work to close tolerances on short shafts and similar parts that include shoulders and different diameters. The design includes a new headstock spindle, a new hydraulic footstock, and the Truform preloaded ball slide dresser.

The headstock spindle is automatically adjusted laterally for positioning the work in relation to the wheel. A two-speed motor powers the spindle for automatic driving-dog engagement.

The Truform dresser provides exact profile duplication on the wheel, and permits face grinding at right angles to the diameter of the work.

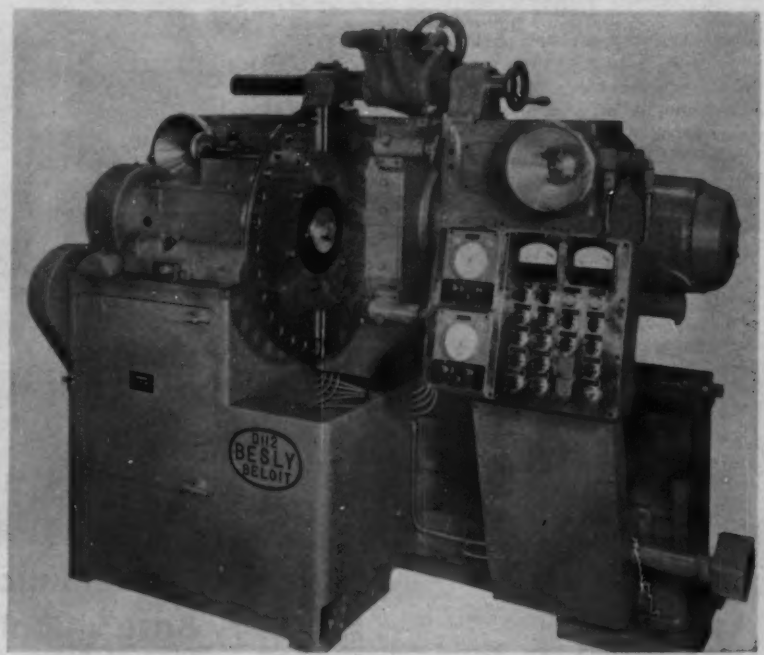
The footstock has a ball sleeve—preloaded balls between the spindle and the housing—to prevent shake and center runout.

A rotary indexing work carrier conveys parts to the work centers, which center the work and locate it laterally. Grinding begins automatically when the work is positioned. A sizing gage controls feed when the Microfeed grinding cycle is in operation; operating the wheelhead so it retracts when final dimension is met, and ejecting the work back to the rotary carrier.

Hydraulic system is isolated from the machine base to reduce heat and resulting distortion in the work.

Landis Tool Co, Waynesboro, Pa—Booth 823

MORE DATA? Circle 244, inside back cover



Besly-Welles Double-Spindle Grinder Equipped for Automatic Parts Handling

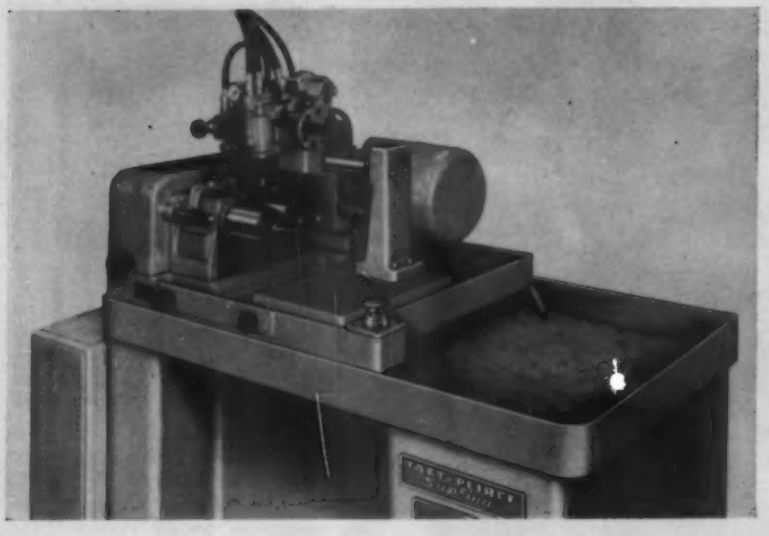
DH 2 disk grinder is a high-production machine with a rotary work carrier that automatically loads and unloads the parts being finished. The machine also has automatic sizing.

Through-feed grinding is done, as well as operations that require part clamping to assure ground surfaces square to mating surfaces

Besly-Welles Corp, South Beloit, Ill—Booth 251

MORE DATA? Circle 246, inside back cover

GRINDING, HONING, LAPPING—Machine Tool Exposition in Print



High-Production Barnes Honer Finishes 2-in. Bores x 12 in.

Model 122 vertical honing machine has 12-in. stroke and 12-in. swing, with a bore capacity of 2 in. at maximum stroke. Size consistency of 0.0002 in. from bore to bore is maintained by the Barnesdril Plugmatic sizing unit.

Electrical controls are enclosed in the machine, which is a compact design that requires minimum floor space. Hydraulic equipment—pump and valves—and coolant pump are mounted in the open for easy access. Operating controls are at the operator's right hand, and setup controls are protected by a cover to prevent undesired accidental changes.

Infinite honing adjustment is controlled by a simplified electric hone-expansion unit that handles rapid expansion, rapid collapse, and automatic wear compensation.

Barnes Drill Co, Chestnut St, Rockford, Ill—Booth 152

MORE DATA? Circle 248, inside back cover

Taft-Peirce Microstoning Machine Has Fully Automatic Work Cycle

The Supfina No. 86 centerless plunge-cut microstoning machine finishes the outside diameter of small parts which require an unusually fine microinch finish, precise form accuracy, and sound surface structure, and does it automatically.

The machine microstones parts by turning them between two rotating rolls, where they are kept in contact with a rapidly oscillating abrasive stone. This action removes the amorphous surface layer left by cutting pressures and temperatures of previous operations, and corrects such defects as chatter marks, feed-spirals, and out-of-roundness.

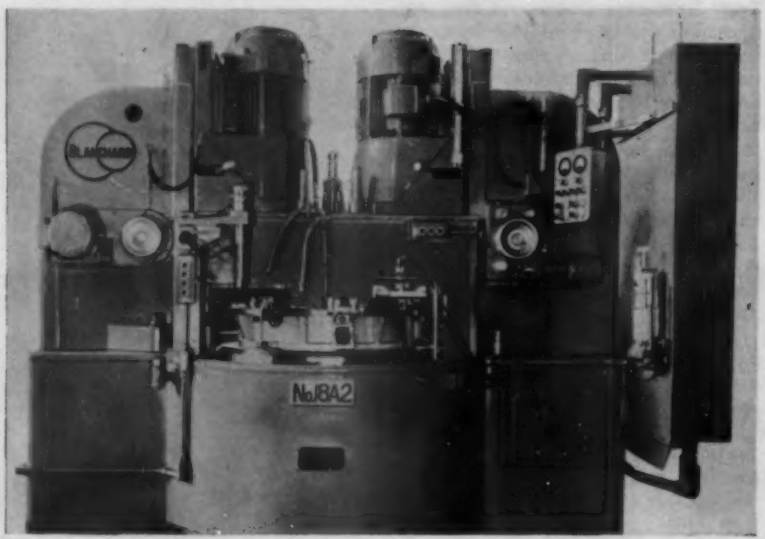
Depending upon the material, hardness, and initial roughness, parts can be finished down to one microinch, with simultaneous out-of-roundness correction of 75% or better.

The microstoning head oscillates at 2000-3000 cycles a minute, and its amplitude is adjustable from 0.080 to 0.200 in. Workpieces up to 2 in. long and from ⅛ in. to 1⅛ in. in diameter can be finished. The machine is designed for fast cycling and for hand or semi-automatic work loading. The finishing operation itself is automatic.

Also on display will be the Model 88 microstoning machine, a through-feed model which passes the workpieces under a series of abrading stones.

Taft-Peirce Mfg Co, Mechanic Ave, Woonsocket, RI—Booth 1426

MORE DATA? Circle 247, inside back cover



Blanchard Automatic Surface Grinder Has "Dry Base", Control Lock, 60 HP

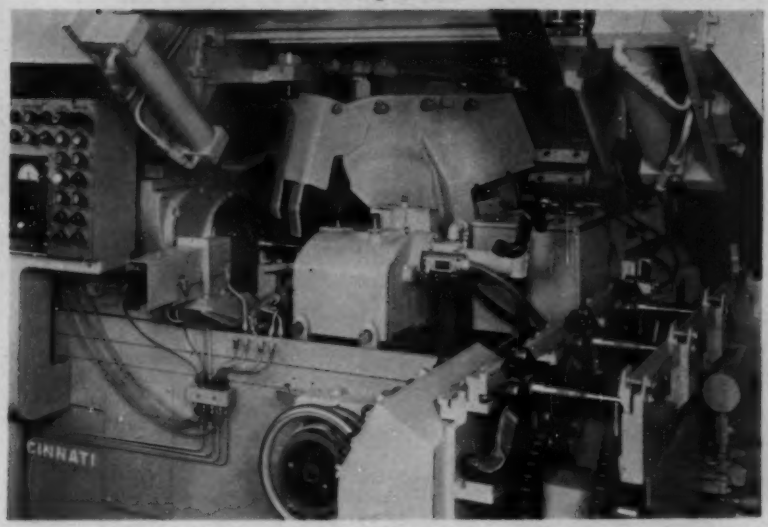
Dual-spindle grinder, No. 18-A2, is equipped for automatic warning (flashing light) when grinding wheels should be replaced, and has interlocked controls. Basic plain table will mount any convenient work or fixtures.

"Dry-base" design includes coolant and chip flow to an outside coolant system or settling tank, which improves accessibility on grinding area. Both six-speed gearbox for table rotation and the feed control can be preset, then locked by a setup man.

Power is provided by 30-hp motors. Machine design allows setting up eight-station fixture with different work at each station.

Blanchard Machine Co, 64 State St, Cambridge 39, Mass—Booth 1209

MORE DATA? Circle 249, inside back cover



Angular-Wheel-Slide Grinder Combines OD and Shoulder Grinding in One Cycle

Shoulders and shafts are ground simultaneously, with critical dimensions, angles, and corner radii established at the same time on Cincinnati's line of semi-automatic angular-wheel-slide grinders.

The machines are available in two basic sizes—6-in. swing and 10-in. swing. These "regular" models can be modified to handle parts with flanges larger than 6 in. or 10 in. by raising the headstock, tailstock, and wheel slide two inches. These modified machines, known as the "light" models, have swings of 10 in. and 14 in., respectively.

Typical applications include crankshafts, steering knuckles, gear blanks with hubs, and stepped shafts with critical flanges, tapers, and shoulders. Built to feed at either 30° or 45°, these machines make it easy to obtain a superior circular line finish instead of a criss-cross finish.

Automatic behind-the-wheel profile truing provides two to ten passes with or without diamond advance on the last pass, and may be set to true after a predetermined number of pieces have been ground. Automatic wheel balancing is standard on all models.

Automatic cycling hydraulically clamps the table, rapidly advances the wheelhead, starts work rotation, grinds at fast feed rate, grinds at slow feed rate, tarries, rapidly returns the wheelhead, stops work rotation, and unclamps the table. A variety of optional equipment is available.

Sizing adjustments as fine as 0.00005-in. on work diameter are possible because of the hydraulic motor drive of infeed screw.

Grinding Machine Div, Cincinnati Milling Machine Co, Cincinnati 9, Ohio—Booth 1034

MORE DATA? Circle 250, inside back cover

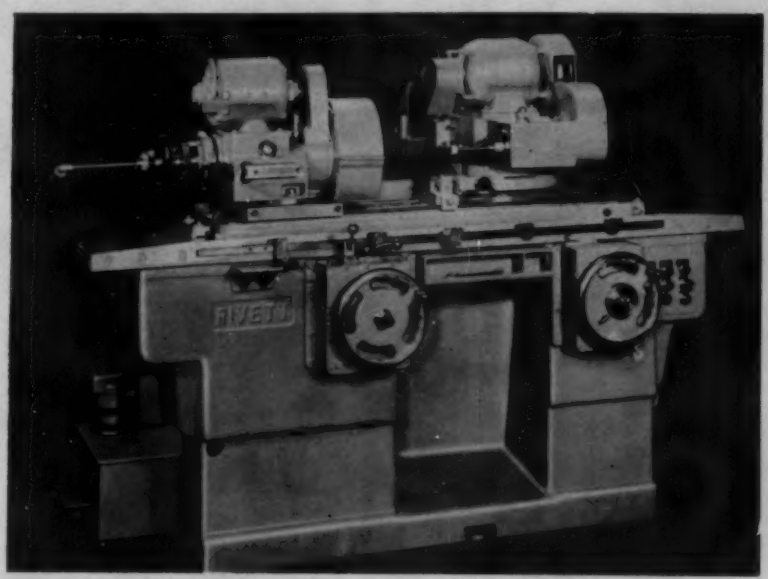
Spiropoint Drill Sharpeners Grind Self-Centering Tools

The spiral-point theory is applied to drill geometry by Cincinnati's Spiropoint drill sharpener—capacity in drills from 0.040 to 1 in. diameter. Grinding time for one drill is less than a minute.

Spiral-pointed drills are said to center themselves without the need for centerdrills, and some reaming operations can be eliminated.

Cincinnati Lathe & Tool Co, Cincinnati 9, Ohio—Booth 934

MORE DATA? Circle 251,, inside back cover

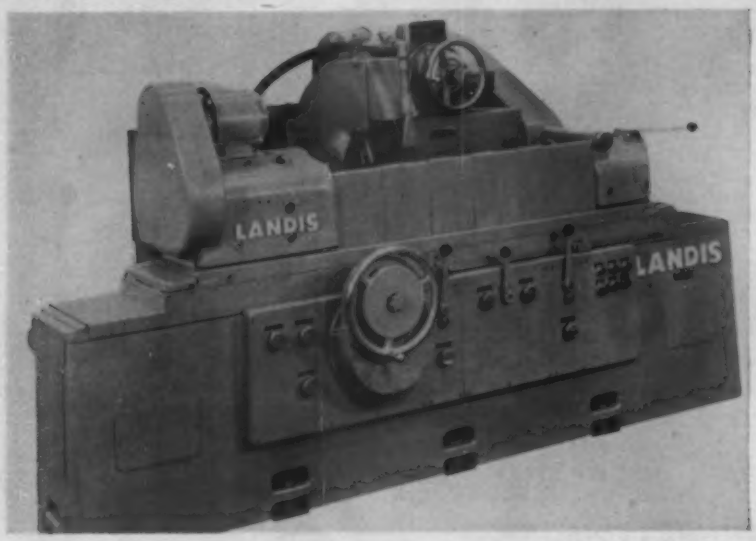


Rivett Internal & Universal Grinder Cuts Setup Time and Conversion

Model 1024 internal and universal grinder has a swivelling double-end wheelhead that converts the machine quickly from internal to external work. Tolerance on hole grinding is said to be +0.0003 in., —0.0000 in. Maximum work size is 9 in. on hole.

Rivett Lathe & Grinder, Inc, Brighton 35, Mass—Booth 1210

MORE DATA? Circle 252, inside back cover



Plain Cylindrical Grinders by Landis Feature Independent Hydraulic System

Heat buildup in the machine due to hydraulic-system heating is eliminated in Type R cylindrical grinders. Hydraulic reservoir and motor are located away from the machine bed, and there are no open hydraulic drains in the bed.

Increased structural strength, another feature of the machine, is given with thicker bed walls, thicker tables and carriages, and more rigid design.

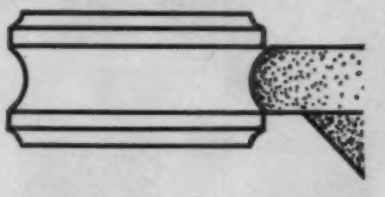
For semi-automatic operation, the machine has rapid wheelhead motion; therefore rate and amount of feed can be observed by the operator. Intermittent slow feed is engaged for traverse grinding—with a total of 0.082 in. on diameter.

When amount of stock to be removed is not uniform, a lever-controlled feed speedup is provided on machines with rapid wheelhead movement. Slow feed can be manually overridden until the wheel is about to contact the work.

The machine is available with the Size Finder, a direct-reading indicator (set by the operator) that indicates when the work has been reduced to desired diameter.

Landis Tool Co, Waynesboro, Pa—Booth 823

MORE DATA? Circle 253, inside back cover



CONCENTRIC BEARING-RACE GRINDER by Landis Tool operates with a magnetic chuck to finish the OD's of inner races. Work is loaded on an arbor with wear strips that fit the race ID. Arbor moves close to rotating chuck, which grips side of work and forces rotation. Work spins on wear strips, being constantly recentered by rotating chuck. Formed wheel touches OD to produce contour. Sparkout is by timer control; roundness of OD is claimed to be better than that for the bore.—*Landis Tool Co, Waynesboro, Pa*—Booth 823

MORE DATA? Circle 255, inside back cover

LAPOINTE 72-IN. BROACH SHARPENER applies Micro-Feed attachment for minimum stock removal when sharpening internal or external broaching tools. Three-speed frequency changer works with spindle motor to produce spindle speeds to 10,800 rpm. Air spindle backs off surface broaches. Other equipment includes dust collector, swivel chuck, spray-mist cooling, motorized headstock, and tailstock with indexing attachment—*Lapointe Machine Tool Co, Hudson, Mass*—Booth 1229

MORE DATA? Circle 254, inside back cover

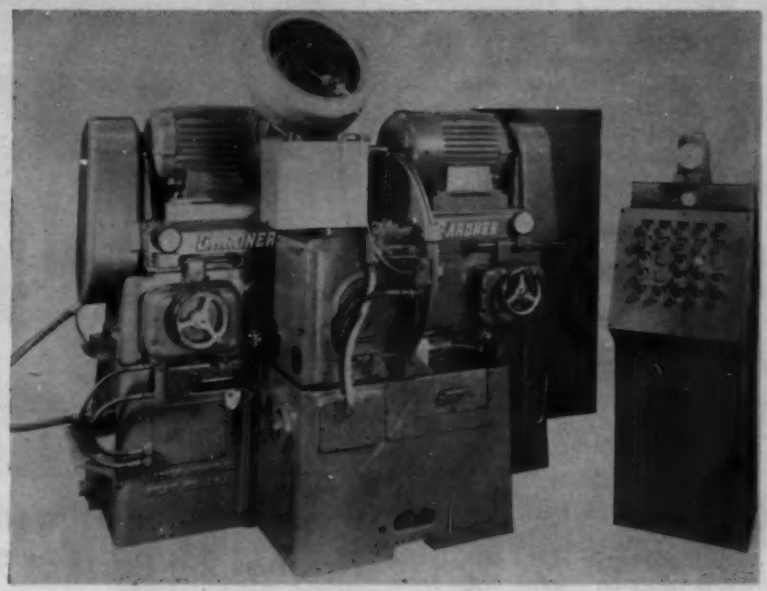
AUTOMATIC CUTTER GRINDER can be set up to grind right or left-hand, plain or stagger-tooth cutters. Once set up it will sharpen identical cutters without attention from operator. Grinder features automatic wheel truing (AM—Nov 16 '59, p186)—*Cincinnati Milling Machine Co, Cincinnati 9, Ohio*—Booth 1034

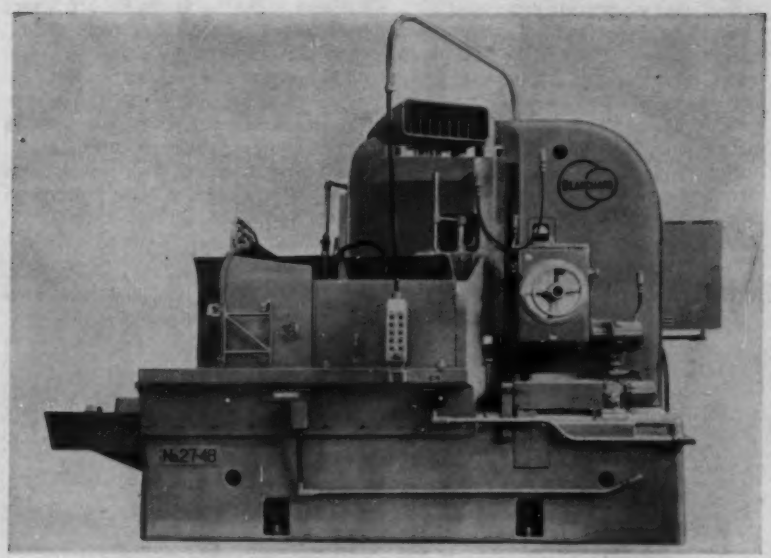
MORE DATA? Circle 256, inside back cover

Gardner Double-Disk Grinder Finishes Bearing Rollers

Double-disk grinder finishes ends of bearing rollers at 12,000 to 15,000/hr to finish of 12-15 micro-in. rms. Automated machine, a model 2H30, loads and unloads parts, dresses the wheels, and meets uniformity tolerance of 0.0003 in. Maximum work length is 4 in. Spindles are horizontal; parts are fed from rotating hopper bowl. — *Gardner Machine Co, Beloit, Wis*—Booth 811

MORE DATA? Circle 257, inside back cover





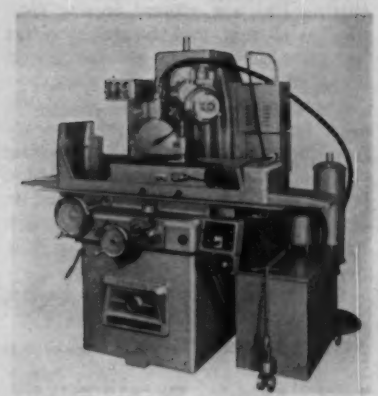
75-HP Blanchard Horizontal Grinder Features 4-ft Table, 27-in. Wheel

Power for heavy stock removal, and rigidity for high accuracy are features of Blanchard No. 27-48 surface grinder, which has hardened bedways and "day-base" construction with a conveyor sludge tank mounted at the rear. There are 52 in. of clearance inside the waterguards, over the 48-in. magnetic chuck. The 27-in. segmented wheel has 12 in. of vertical travel. Coolant flow is both inside and outside the grinding wheel.

The machine is equipped with a motorized single cut device and a floor-mounted control panel. The Trabon lubrication system for spindle bearings, wheel dresser, and head ways is hand operated. Automatic Bijur lubrication is attached for the ways. Table-bearing and chuck-rotation units have oil reservoirs.

Blanchard Machine Co, 64 State St, Cambridge 39, Mass—Booth 1209

MORE DATA? Circle 258, inside back cover



GRAND RAPID SURFACE GRINDER, Model 360, features Incrematic automatic downfeed control (AM/MM—Apr 18 '60, p146). Once required stock removal is dialed in, and removal rate is selected, machine operates automatically until only 0.0001 in. of excess stock is left for finishing pass—*Gallmeyer & Livingston Co, 400 Straight Ave, SW, Grand Rapids 2, Mich*—Booth 751

MORE DATA? Circle 259, inside back cover

Leland-Gifford Grinder Produces Drill Points, 0.0135-0.250 in.

The Drill Point Master will produce or reproduce a drill point of any specified geometry on drills from No. 80 (0.0135 in.) to 0.250 in. This new machine has precision adjustments for locating the drill in reference to the grinding wheel, indexing the drill 180°, and obtaining any desired

point angle from 60—180°, with any relief angle from zero to 26°.

The grinder, which has completely enclosed electrical controls, has a sandwich wheel especially developed for clean, dry grinding and accurate point thinning without burning.

This machine's collet chuck is mounted so that any length drill can be ground without interference. One collet chuck, whose clamping receiver automatically sets correct protrusion of drill from collet, serves both sharpening and thinning positions without readjustment.

Leland-Gifford Co, Worcester 1, Mass—Booth 631

MORE DATA? Circle 260, inside back cover

Drill Pointer Grinds 2-, 3-, 4-Flute Drills in Sizes from ½ to 3 in.

Model 600 drill pointer features the Oliver point with increased clearance at the center of the drill. It has the capacity to handle drills from ½ to 3 in. in diameter and can grind two, three, or four-flute drills. All cutting lips are ground in one continuous motion, and the machine has provision for various clearance and included point angles.

The model 600 is also available with an "airdraulic" automatic infeed which makes drill pointing completely automatic once machine is set up. This automatic infeed is primarily designed for shops which have a predominance of large size drills to point.

Oliver Instrument Co, Inc, Adrian, Mich—Booth 342

MORE DATA? Circle 261, inside back cover

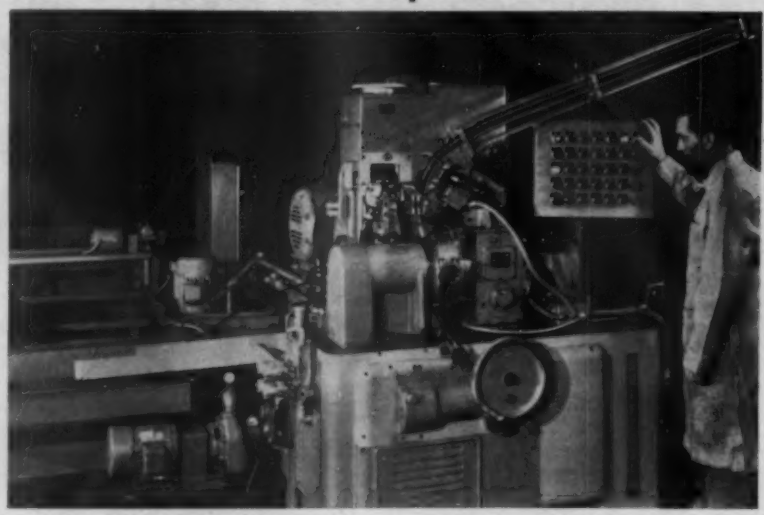
Landis Abrasive No. 618 Grinder Has Power Traverse, Feed

Model 618, formerly available only as a hand-operated grinder, now has hydraulic power to the table traverse and saddle crossfeed, with up to 0.375 in. motion per table stroke. Traverse operates at variable rates up to 90 fpm.

Saddle and table are mounted on roller bearings for easy action; and both are equipped with interlocks so handwheels must be disengaged before power can be applied. Large spindle and motor assembly is dynamically balanced, and spindle is lifetime lubricated. Central one-shot lubrication system serves other moving parts. With a 12-in. wheel, the machine has 2 hp; with a 7-in. wheel, 1 hp at 3450 rpm.

Landis Tool Co, Waynesboro, Pa—Booth 823

MORE DATA? Circle 262, inside back cover



Sheffield Crushtrue Multi-Form Grinder Finishes 2-4 Parts at 9000 sfpm and Up

Model 182 cylindrical form grinder operates a single Crushtrue-dressed wheel, or two wheels separated by a spacer, to form two or four parts simultaneously. Work is held in a 15-in. drum-shaped cage, with drive roll inside, so one part (or pair) is ground above the centerline, and one below.

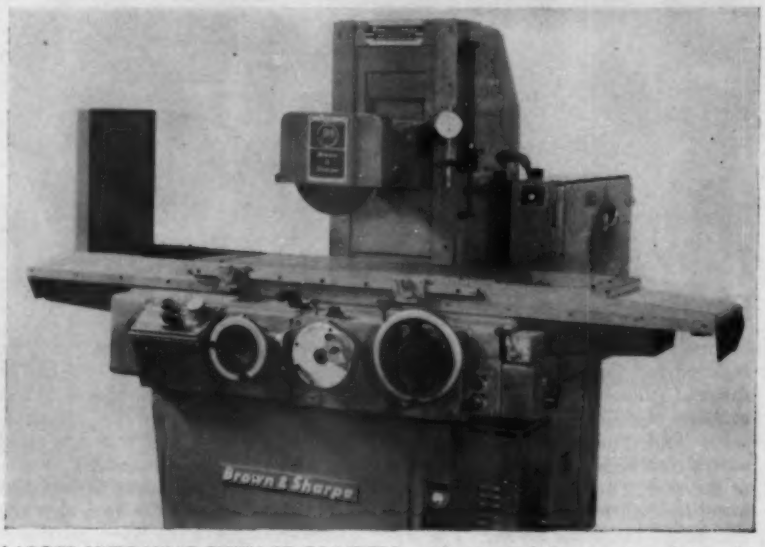
Part handling, grinding, wheel dressing, and wheel compensation are all automatic. The wheel is crush dressed by a steel or carbide roll at 250-300 sfpm. Wheel hardness can range up to "U" grade. Automatic wheelhead advance compensates for wheel wear.

Parts indexing takes only 0.5 sec; parts are fed to the cage from above, then presented to the wheel in pairs, end-clamped and rotated.

Wheel diameter is 20 in., width 5¼ in.; maximum work diameter is 2¼ in.; wheel speed up to 9200 sfpm; maximum infeed ¼ in. Typical parts handled are automotive piston-rod shafts and water-pump shafts.

Sheffield Corp, Dayton, Ohio—Booth 381

MORE DATA? Circle 263, inside back cover



LARGER HYDRAULIC SURFACE GRINDERS, with unitized construction, bring the B & S redesigned line to five sizes. New grinders being introduced are 8 x 24-in., 10 x 24-in., and 10 x 30-in. (AM/MM—Aug. 8, '60, p126)—*Brown & Sharpe Mfg Co, Providence, RI*—Booth 452 MORE DATA? Circle 264, inside back cover

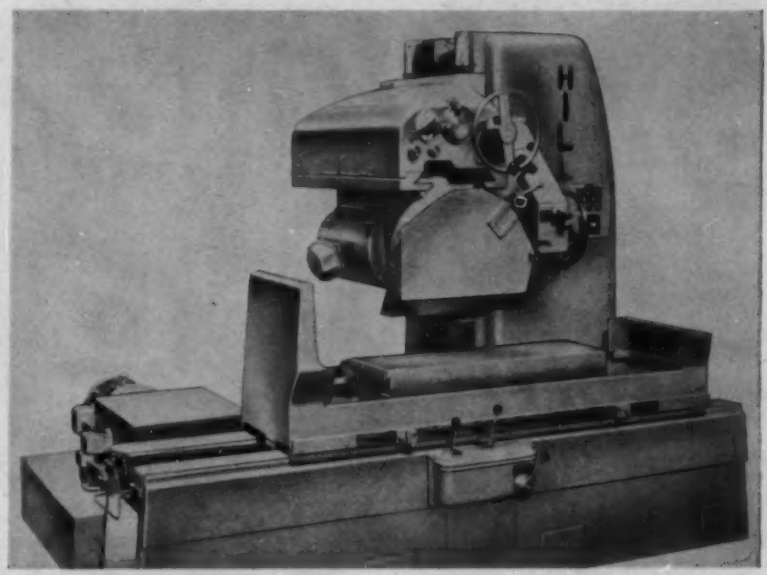
Hill Acme Horizontal Grinder Features 100% Hydraulic Drives

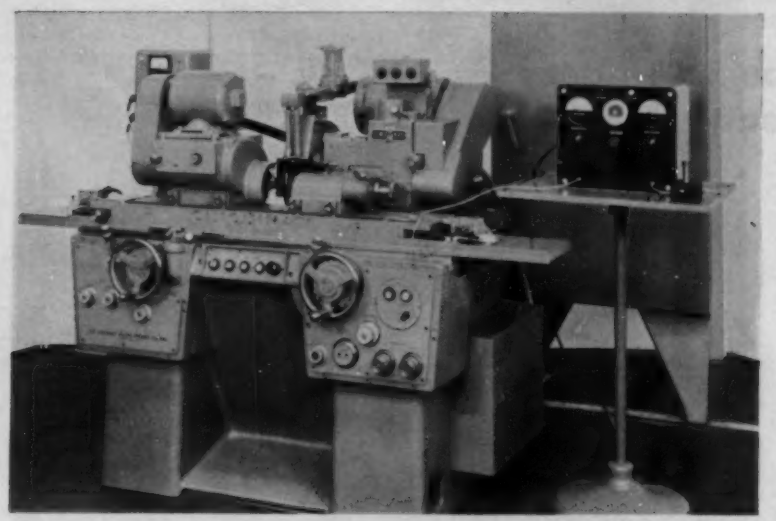
Horizontal spindle heavy duty precision surface grinder has dynamically balanced built-in spindle motor, hydraulic or manual cross feed. This 14 x 16 x 42-in. capacity machine has rapid traverse and hand wheel with micrometer feed for wheel head control. Operating controls are instantly accessible.

The grinder, which also comes in a 14 x 16 x 48-in. size, has 100% hydraulic drive for table and cross feeds. A forced feed lubrication system is provided for lubricating the table and bed ways and also the front spindle bearing.

The Hill Acme Co, 1201 W 65th St, Cleveland 2, Ohio—Booth 1240

MORE DATA? Circle 265, inside back cover



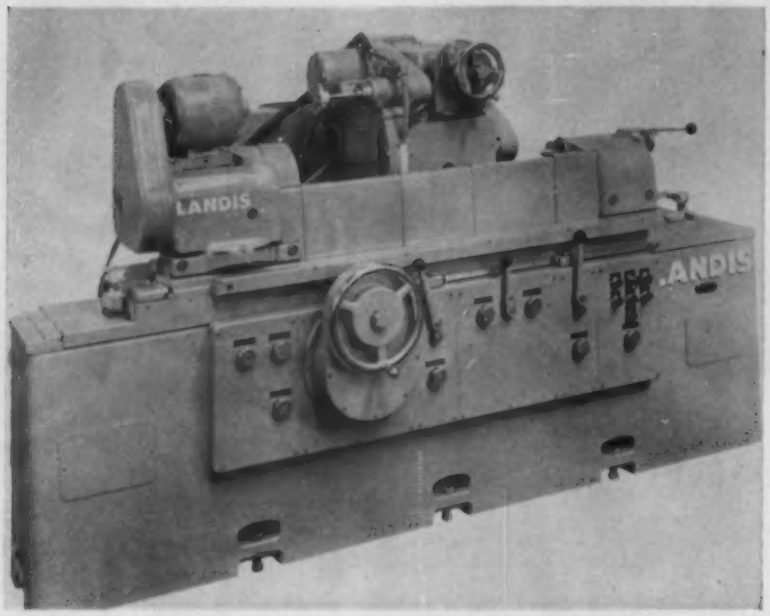


MATCHED-HOLE GRINDER combines a 4-in. Super Precision grinder with a built-in Grind-A-Mate gaging system. Machine is designed for machining critical mating parts. It can hold tolerances of 0.000,010 in. for roundness, 0.000,020 in. for straightness, 0.000,-025 in. for size, and four microinches for surface finish. Gaging system consists of OD and ID air gages and a high amplification differential meter. Clearance between mating parts is set on dial. Once gages are set, grinding cycle is automatic (AM—Nov 30 '59, p123) — *Cincinnati Milling Machine Co, Cincinnati 9, Ohio*—Booth 1034

MORE DATA? Circle 266, inside back cover

CENTERLESS GRINDER, Centuramic 340-20, has infinitely adjustable regulating wheel speeds from 11 to 300 rpm, and features a 40-hp grinding wheel drive. Grinder uses 20-in.-wide grinding and regulating wheels. Also to be shown is the Model 220-8, a 20-hp machine. Other models in the Centuramic line (AM—Nov 2 '59, p140) include the 325-12 (25 hp) and the 330-15 (30 hp)—*Grinding Machine Division, Cincinnati Milling Machine Co, Cincinnati 9, Ohio*—Booth 1034

MORE DATA? Circle 267, inside back cover



Landis Universal Type R Grinders Have Rapid Wheelhead Motion

Fast, accurate swivel-table adjustment and hydraulic rapid wheelhead movement are features of Type R universal cylindrical grinders. The swivel is a simple, low-cost attachment with easily read indicators at each end of the table.

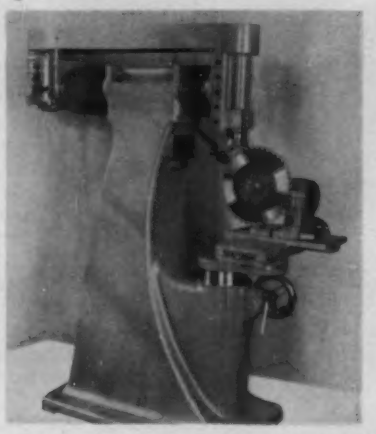
Rapid wheel approach and continuous hydraulic slow grinding feed are also available, in addition to intermittent feed. A dial controls the rate and amount of feed. Maximum rate is 0.082 in. on diameters. The hydraulic feed will move the head at any angle to which it is set. A spring-loading arrangement eases adjustments of the head to required angles.

The machine can be fitted with Microfeed for fine feed controlled by a single contact gage. This has constant reset, so the original conditions can be reestablished for the next cycle. Accuracy is claimed to be within 0.000,010-in. for roundness. A semi-automatic cycle will plunge grind to remove 0.003 in. to finish size.

Other features of the machine line include new design and increased rigidity for beds and carriages, independent hydraulic system that keeps heat away from the bed, all V-belt drive, hydraulic or hand carriage traverse, and front-controlled speeds to 500 rpm.

Landis Tool Co, Waynesboro, Pa—Booth 823

MORE DATA? Circle 268, inside back cover

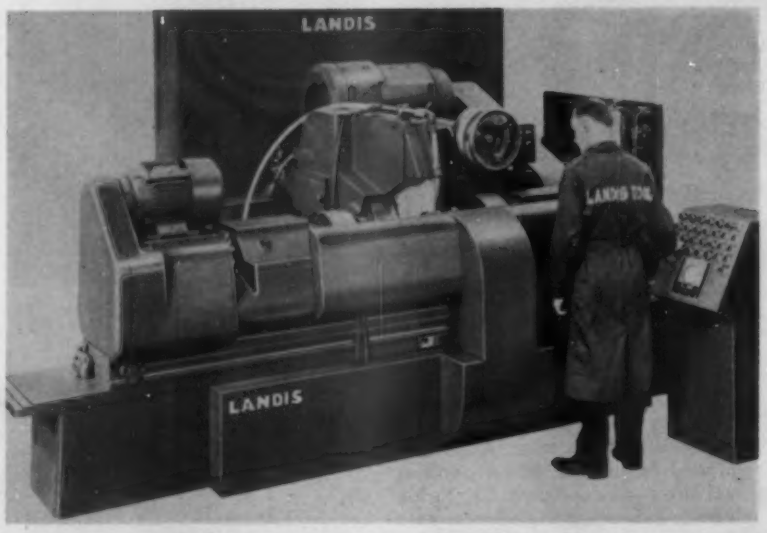


Automatic Face Mill Grinder Takes Cutters up to 24 in. in Diameter

Model 624 automatic face mill grinder has been designed to grind face mills from 6 to 24 in. in diameter. Machine also makes it possible to grind new tooth forms around the periphery of a cutter. Dressing, grinding, indexing, upfeed, roughing and finishing cuts—all are automatic.

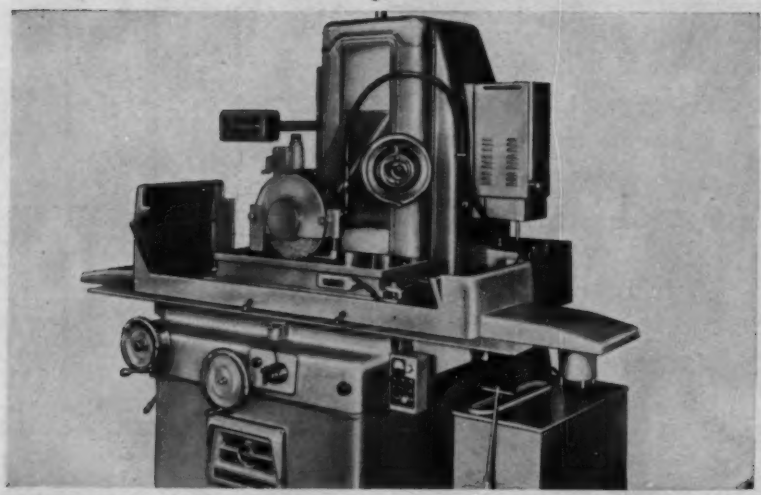
Oliver Instrument Co, Inc, Adrian, Mich—Booth 342

MORE DATA? Circle 269, inside back cover



FIRST AUTOMATIC SETUP FOR AUTO-CRANKSHAFT GRINDING, by Landis Tool, produces all crankshaft line bearings on a 10-in. IWR multiple-wheel grinder and all throw bearings at a new pin grinder. Automatic conveyor equipment between machines completes automatic handling from a conveyor, to both machines, and out to another conveyor, with all bearing surfaces finish-ground. IWR grinder has new heavy, ribbed bed; Microfeed for better accuracy; front wheel dressing on each of the multiple wheel, and automatic work rest. Crankpin grinder has a single wheel with automatic indexing "on the fly," special locator that lines up work with wheel, wedge-type work rest, Microfeed, and Truform dresser with rotating diamond dressing wheel controlled from a profile bar—*Landis Tool Co, Waynesboro, Pa*—Booth 823

MORE DATA? Circle 270, inside back cover



Surface Grinder Has Table Speeds to 135 fpm

The Model 560 hydraulic-feed surface grinder has a table with a working surface of 14x36 in. and a maximum longitudinal speed of 135 feet per minute. The hydraulically powered table has a maximum longitudinal travel of 40 in. and a maximum transverse travel of 15¾ in.

Machine uses a 14x1½x15-in. grinding wheel and provides a vertical wheelhead motion of 18 in. Spindle speeds range from 1800 to 3140 rpm.

Gallmeyer & Livingston Co, 400 Straight Ave, SW, Grand Rapids 2, Mich—Booth 751

MORE DATA? Circle 270, inside back cover

Thread and Form Grinder Does Plunge or Traverse Forming

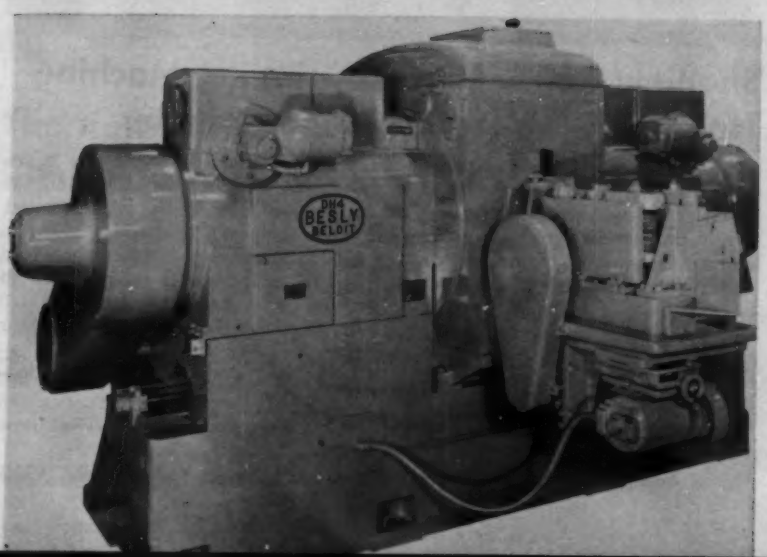
Model 103 precision thread and form grinder will produce Class 3 threads by plunge or traverse grinding, and will plunge similar forms on parts up to 24 in. between centers and to a 3-in. diameter.

Wheel dressing is by Crushtrue device for pitches from 8 to 40 tpi, and by diamond dresser for pitches up to 80 tpi. Single or multiple threads can be produced. Grinding wheel is 13 x 1¼ in.

Change gears provide all standard US pitches from 8 to 60 tpi; a lead-varying mechanism is included on the machine. Wheelhead speeds range from 1750 to 2000 rpm. Wheelhead motor has 5 hp; workhead motor 1/3 hp.

Sheffield Corp, Dayton, Ohio — Booth 201

MORE DATA? Circle 271, inside back cover



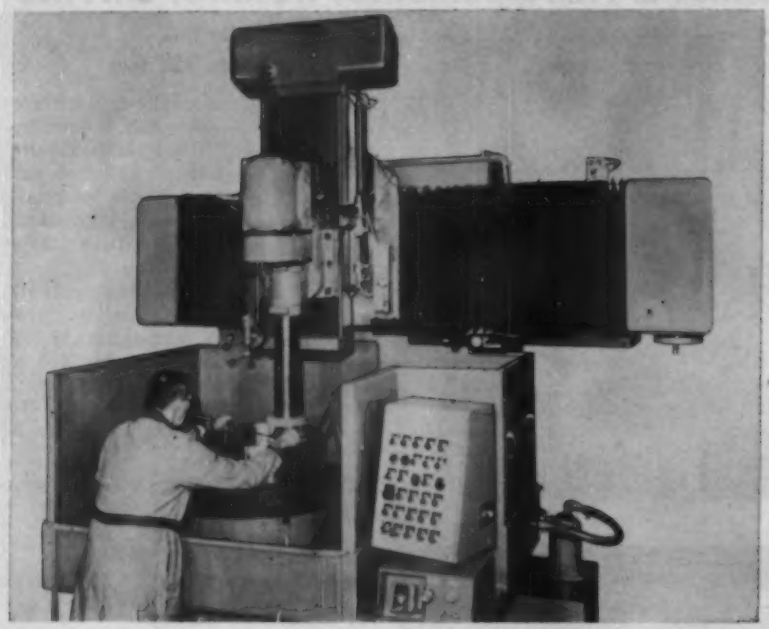
Double-Spindle Grinder Performs Automatic Dressing and Sizing

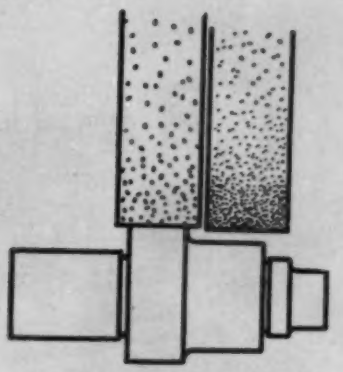
Model DH 4 horizontal double-spindle disk grinder operates by push-button and maintains accuracy to tenths. The equipment has one-shot lubrication, simple 3-stop abrasive change, and an improved coolant system.

The machine grinds parallel faces on parts such as rings, valve-seat inserts, and other pump components, as well as any high-production part.

Besly-Welles Corp, South Beloit, Wis—Booth 251

MORE DATA? Circle 272, inside back cover





DISTRIBUTOR-CAM GRINDER BY LANDIS does automatic roughing and finishing on eight-lobe automotive cams. Ten-station rotary indexing carrier moves work to expanding arbor at roughing (plunge) wheel, then arbor shifts to finishing wheel for a skive cut. Machine has pressure-lubricated Microsphere babbitt-lined bearings in spindle head. — *Landis Tool Co, Waynesboro, Pa*—Booth 823

MORE DATA? Circle 274, inside back cover

Frauenthal Turning, Grinding Machine Meets Special Contouring Requiremets

Precision to ± 100 millionths of an in. is possible on this new 1200 Series single-spindle grinder which may be fitted with a vertical tracer or numerical control. Design for contour or conventional grinding, the new machine may be ordered with a new electro-hydraulic tracer accurate to ± 10 millionths in. Manual control is supplied as standard equipment.

A hydraulic system on the tracer which has all-transistorized controls guides both vertical and horizontal axes simultaneously through 360° of motion. And any variation from true contour path between templet and work slide is indicated immediately on a continuous recorder.

The 1200 is available in two models with table diameters from 24—42 in. and nominal swings of 36 or 48 in. Infinitely variable feed and speed ranges with potentiometer-controlled dc drive are supplied.

Also being shown is a representative of the new 900 Series. These machines, which are custom-designed, utilize a vertical design to eliminate the deflection normally encountered when large unsupported parts are machined in a horizontal position. It has most of the same features of the 1200.

Frauenthal Div, The Kaydon Engineering Corp, Muskegon, Mich — Booth 1220

MORE DATA? Circle 273, inside back cover

Sheffield Roll & Groove Grinding Machine Handles 5-Ft Work to 14-in. Diameter

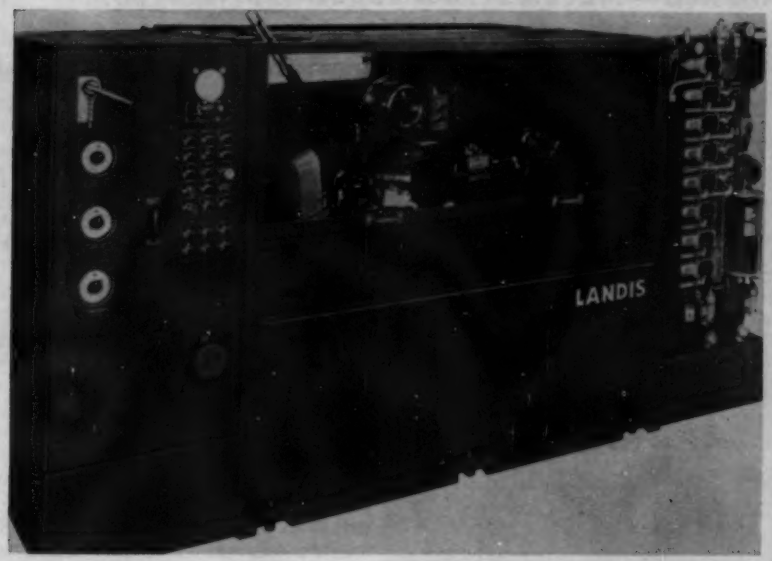
Model 181-A Crushtrue roll grinder is an automatic grinding machine for large cylindrical work that requires contouring such as grooves. The machine has crush dressing automatically controlled, and variable speed control for fast or slow wheel feed into the work. A plunge device provides rapid approach and retraction.

Cam-controlled feed with variable 0.500-in. dwell time is included. The work table will swivel, controls are electro-mechanical, ways are lubricated by a central system, and the wheelhead spindle is grease-sealed.

Wheel speeds are 1150, 1270, and 1390 rpm; maximum wheelhead feed is 0.500 in. Wheelhead motor is rated at 15 hp; workhead motor at 1 1/3 hp. Table will swivel 5° in either direction.

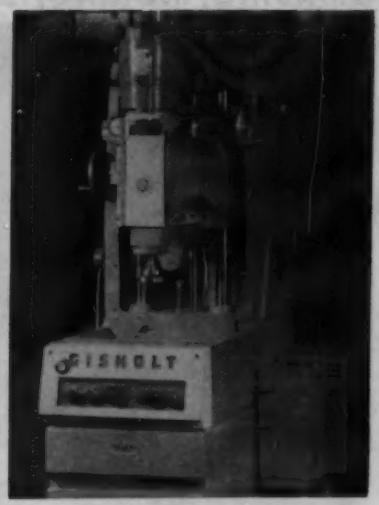
Sheffield Corp, Dayton 1, Ohio—Booth 201

MORE DATA? Circle 275, inside back cover



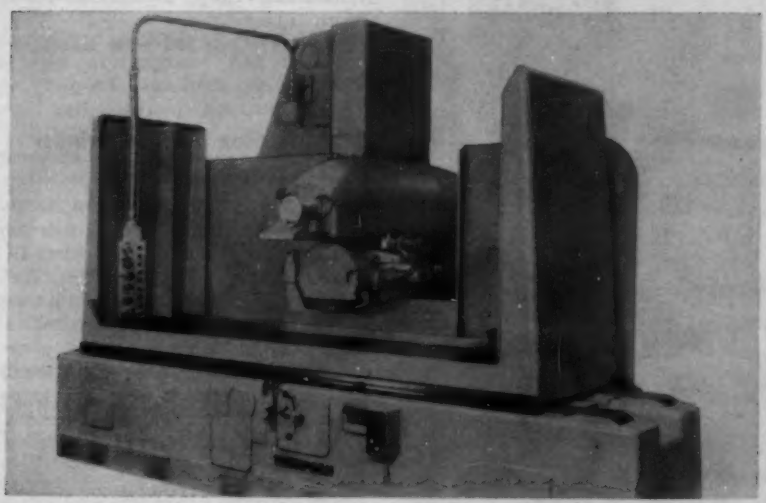
CONCENTRIC ROLLER-BEARING RACE GRINDER positions workpieces on a special mandrel and rotates them by means of sliding contact with a permanent-magnet faceplate. Work rides on wear strips on the arbor, and is continually centered by rotary faceplate action. Formed grinding wheel produces contours without use of rolls. Work arbor moves in to make work contact wheel, then retracts after part has been automatically sized. Machine also includes Microfeed control for accuracy to millionths—*Landis Tool Co, Waynesboro, Pa* —Booth 823

MORE DATA? Circle 276, inside back cover



SUPERFINISHING MACHINES, Masterline Model 51-B (below) and Model 81 (above), are equipped with automatic size control. Model 51-B is designed for jobs not requiring longitudinal traverse. Its platen has a self-contained reciprocating unit on which can be mounted quills carrying one or two stones. A second platen can be added (AM/MM—Aug 8 '60, p126). Model 81 single-spindle Superfinisher automatically handles flat, conical, or spherical surfaces, and is adaptable to automatic work-handling — *Gisholt Machine Co, Madison, Wis* — Booth 1042

MORE DATA? Circle 277, inside back cover



Thompson Grinder Features Pendant Control of Wheelhead Elevation

All vertical movement of the wheelhead, both automatic and manual, on this Type CX 36x48x72-in. Plunge-Matic grinder is controlled through dials on the Cybermatic pendant control Automatic downfeed from 0.0002-0.006 in. in 0.002-in. increments can be set into the machine through a dial on the pendant. Also, the total amount of automatic downfeed for stock removal from 0-1 in. through the entire 42-in. vertical capacity can be dialed in.

From the pendant, the operator can also set automatic downfeed to occur at each reversal of the wheelhead on cross feed as well as on straight plunge feed.

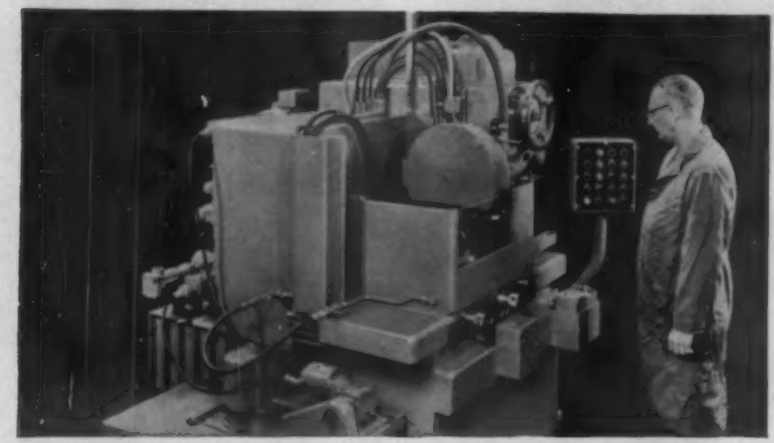
Another feature of the grinder is an automatic wheel trueing device to which a preset dressing increment can be applied.

Equipped with a 50-hp wheelhead with a 20x6x12-in. grinding wheel, this grinder can remove cast iron at the rate of 15 cu in per minute, or it can grid with precision in "tenths."

Thompson Grinder Co, Springfield, Ohio—Booth 850

MORE DATA? Circle 278, inside back cover

GRINDING, HONING, LAPPING—Machine Tool Exposition in Print



Sundstrand-Arter Rotary Surface Grinder Has Magnetic Chuck

Model E rotary surface grinder has a precision horizontal spindle and a reciprocating table on which is mounted a rotating magnetic chuck. A 15-hp motor drives the wheel spindle through V-belts, eliminating the mechanical vibrations of a metal-to-metal contact.

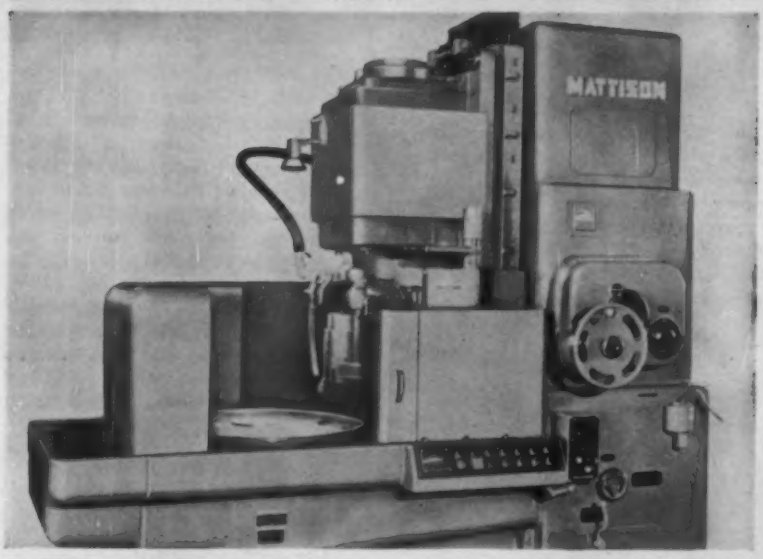
The spindle head can be fed manually or automatically by hydraulic power. An automatic grinding cycle with rapid, feed, dwell, and return is also provided.

Work is held on a Sundstrand low-voltage Power-Grip chuck, which can be driven at speeds from 0 to 300 rpm. The chuck may be tilted from 10° for convex to 19° for concave grinding. The reciprocating table has an infinitely adjustable feed rate of 0 to 19 fpm, and its stroke can be controlled by adjustable stops.

All controls for hand feed and automatic cycle are conveniently located at the operator's right hand. Pressure lubrication is provided to table ways, spindle head ways, and leadscrew.

Sundstrand Machine Tool, Div of Sundstrand Corp, Belvidere, Ill—Booth 1014

MORE DATA? Circle 280, inside back cover



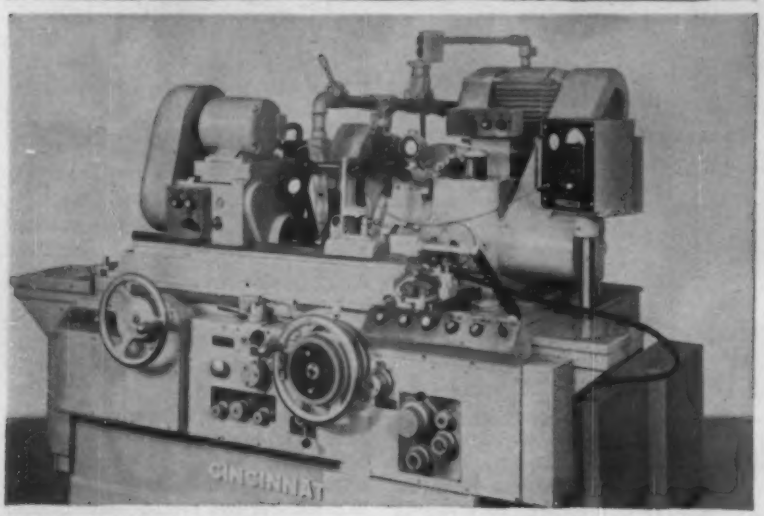
New Mattison Surface Grinder Utilizes Box-Type Column

A one-piece, box-type column backs up spindle horsepowers as high as 125 on this new No. 24 vertical-spindle rotary surface grinder. Because this grinder also has a capacity up to 48-in. dia, accuracies measured in "tenths" can be combined with high-production stock removal. On average grinding operations, productivity can be increased by 50% or more without sacrificing flatness or finish.

The one-piece column is bolted and keyed to the base, forming the equivalent of a single L-shaped Meehanite casting. Grinding wheel thrust is down onto the table and back into the column; deflection and vibration are virtually eliminated. Uniform crossribbing in the heavy, double-walled base provides rigid support under the table, and both bed and column are stress-relieved by heat treating.

Mattison Machine Works, Blackhawk Park Ave, Rockford, Ill—Booth 1206

MORE DATA? Circle 281, inside back cover



PRECISION GRINDER features Acrasize gage control system which checks in the entire automatic infeed system, including coarse and fine feed rates; and checks out the work when accurate size is reached. Grinder illustrated is the Filmatic 6-in. R x 18 in. plain grinder—*Grinding Machine Div, Cincinnati Milling Machine Co, Cincinnati 9*—Booth 1034 MORE DATA? Circle 279, inside back cover

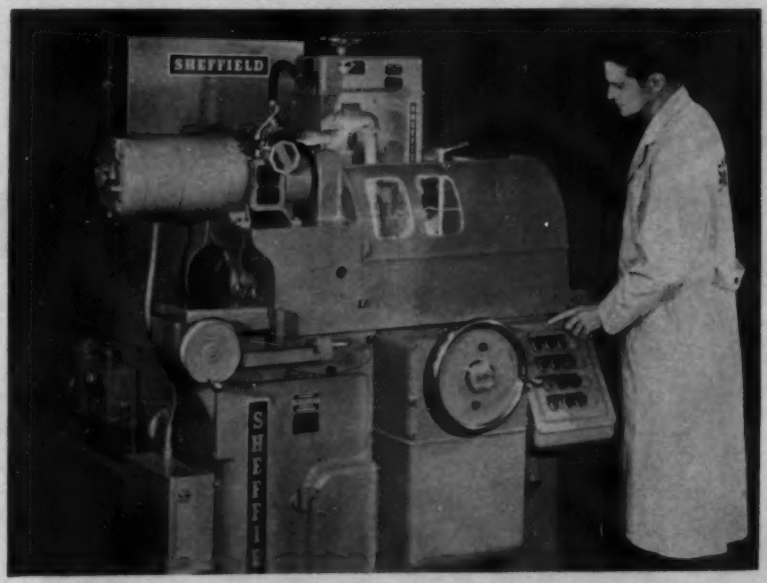
Sheffield 109A Cylindrical Form Grinder Produces Races, Rolls

Cylindrical forms are ground with Model 109A, equipped with Crushtrue dressing unit. Capacity of the machine is 12 in. between centers, 4-in. maximum work diameter (with 14-in. wheel), and work speeds from 64 to 1050 rpm.

Machine has a larger-diameter ground spindle, which allows installing two 1-in.-wide wheels with a spacer between. Infeed device is electro-mechanically cam controlled, with maximum infeed of 1 in. Infeed rate is 0 to ¼ ipm. Adjustable timer provides automatic dwell time up to 30 sec. Automatic loading and unloading can be arranged.

Sheffield Corp, Dayton, Ohio—Booth 201

MORE DATA? Circle 282, inside back cover



Landis 12R Centerless Grinder Regulates Wheel Drive

Precision centerless grinder includes all-new Truform wheel dresser, Landis Lockspeed regulating-wheel drive for rounder work and faster cycles, and a new bed.

The hydraulic system — tank, pump, and valves—is a separate unit at rear of machine. This removes grinding-oil heat from the machine bed, and improves accuracy.

Both wheel-dresser slides are on preloaded balls for exact dressing and profiling of grinding and regulating wheels. Work rest is mounted directly on improved, sturdier bed.

Landis Tool Co, Waynesboro, Pa—Booth 823

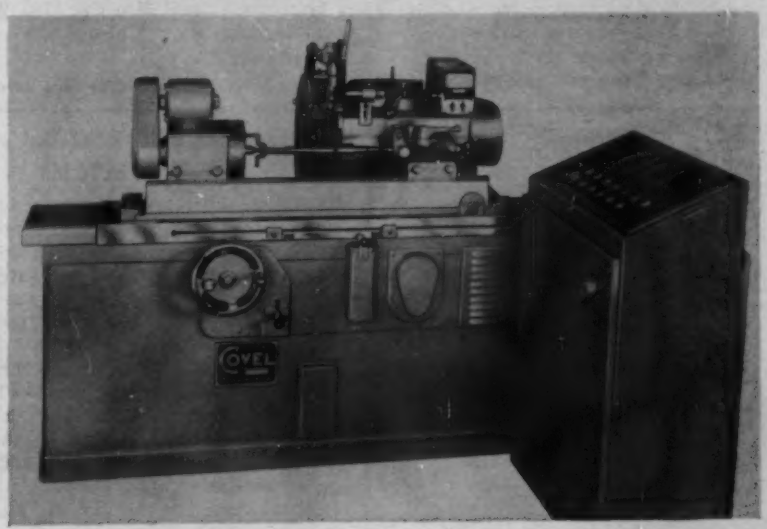
MORE DATA? Circle 283, inside back cover

Covel Grinder Does Automatic Cycling and Sizing

The No. 42A, which is an electronically controlled automatic grinder for production cylindrical grinding on centers of a wide variety of parts, has three cycles that can be selected by a selector switch: Plunge grinding features rapid approach, coarse feed, fine feed, spark out, and retraction when size is reached; traverse grinding has rapid approach, table traverse starts, coarse feed at each reversal of table, fine feed at each table removal, spark out, and retraction at end of table stroke when size is reached; set-up, in which jog pushbuttons are used for

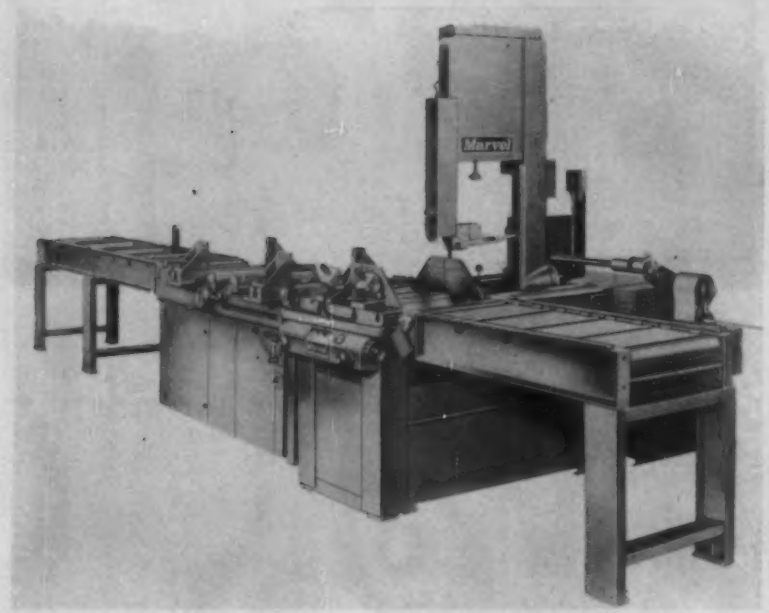
Covel Mfg Co, Benton Harbor, Mich—Booth 332

MORE DATA? Circle 284, inside back cover



MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Cutoff and Filing



Marvel Materials-Handling Equipment Eases Positioning Work at Saws

Multiple indexing attachment on Marvel 81A bandsaw will repeatedly move work from 0 to 38 ft per index (illustrated). Additional new work-handling equipment includes an electric pre-set counter that stops the machine after a given number of cuts have been made, and a coiled-tape travelling length gage read at the operator's station. Power roller tables with infinitely variable speeds are controlled by single lever.

Armstrong-Blum Mfg Co, 5700 W Bloomingdale Ave, Chicago 39 —Booth 1340

MORE DATA? Circle 285, inside back cover

Peerless Carbon-Blade Bandsaw Has Work Capacity of 6x10 in.

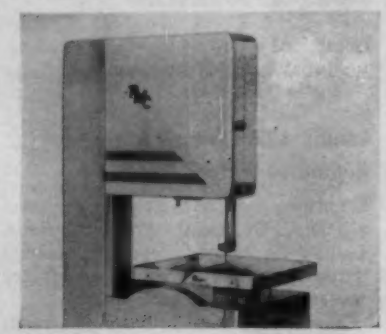
Model 610 carbon-blade bandsaw accommodates work up to 6 in. high and 10 in. wide. Its fast-acting, adjustable vise handles cuts at angles from 90° to 45°.

Powered by a ½-hp 110-volt motor, the saw can be plugged into a standard electrical outlet (other voltages available on special order). Model 610 can also be used for partable contour work by putting the arm in a vertical position and adding an accessory table.

Features include adjustable saw guides, infinitely adjustable pressure control, and cast-iron vise base and jaws. Complete with electrical equipment, the saw sells for $595.

Peerless Machine Co, Racine, Wis —Booth 422

MORE DATA? Circle 286, inside back cover



Peerless Introduces Contour Saw With 26-in. Throat Capacity

Model 2600 contour saw has 26-in. throat capacity, 15-in. height capacity, and has a table that tilts 10° to the left and 45° to the right. A tachometer-controlled variable-speed drive provides speeds from 50-6000 fpm.

The hardened saw-blade guides are replaceable and can be adjusted for blades from 1/16 in. up to ½ in. wide. Maximum blade length is 187½ in.; minimum is 180 in. An air stream blows chips away.

Peerless Machine Co, Racine, Wis —Booth 422

MORE DATA? Circle 287, inside back cover

CUTTOFF AND FILING

BOOTH	EXHIBITOR
1340	Armstrong-Blum Mfg Co Chicago 39, Ill
331	Famco Machine Company Kenosha, Wisconsin
822	The Motch & Merryweather Machinery Co Cleveland 17, Ohio
422	Peerless Machine Co Racine, Wisconsin
1001	Rockford Machine Tool Co Rockford, Ill

MMT=PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

Bending and Shearing

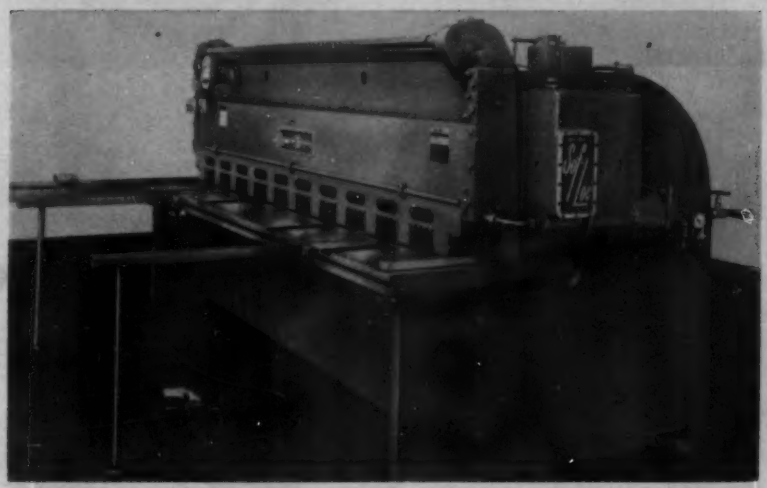
L & S Squaring Shear Features Sof-Loc Holddown System

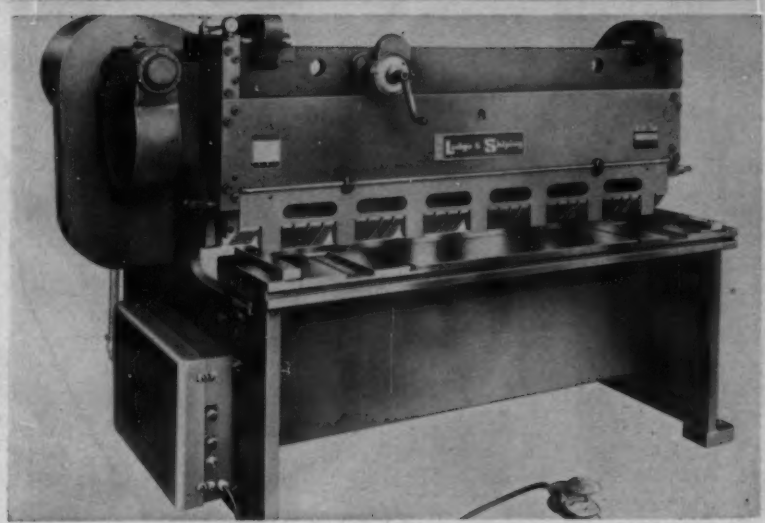
A "Sof-Loc" air-hydraulic holddown system, which is said to give extreme accuracy in squareness and parallelism, is an exclusive feature on this new Model 0410 power squaring shear. Designed for production work, the shear has a ¼-in. x 10-ft capacity and is equipped with a new rugged self-aligning back-gage.

This shear, which is equipped with ram adjustment for slitting and notching operations, will demonstrate the absence of vibration, noise, shock, and damage to material with the low impact "Sof-Loc" holddowns.

The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio—Booth 1046

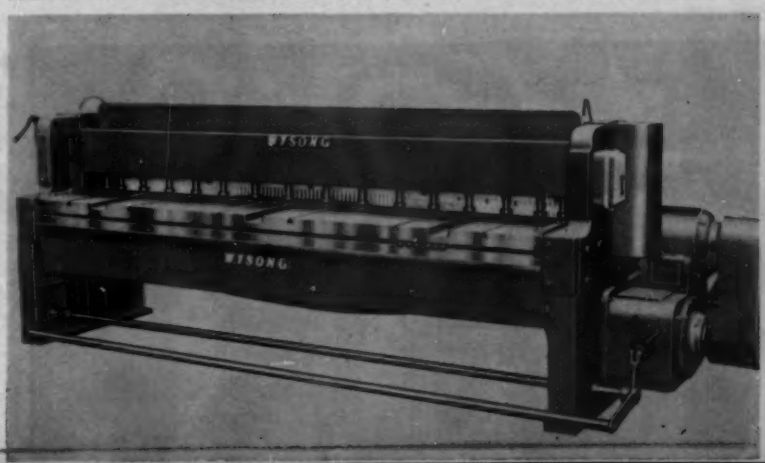
MORE DATA? Circle 288, inside back cover





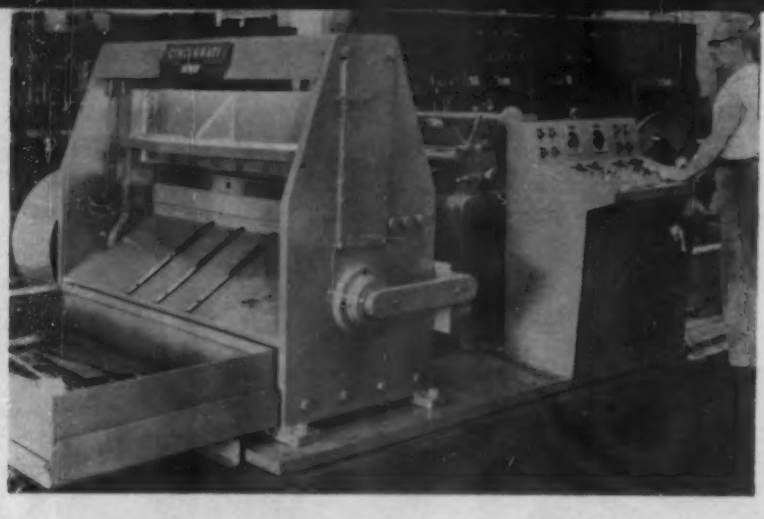
NEW DESIGN 10-GAGE POWER SQUARING SHEAR, Model 0210, has a ⅛-in. x 10-ft capacity and is designed for general light-duty shearing under job and production conditions. It is also equipped with the new front operated back gage—*The Lodge & Shipley Co, 3055 Colerain Ave, Cincinnati 25, Ohio*—Booth 1046

MORE DATA? Circle 289, inside back cover



SQUARING SHEAR, Model 1010-RD, has a capacity of 10-gage mild steel and a cutting length of 10 ft. It features a motorized precision front gage and an air release to prevent jamming of stock between the cutting edge and the back gage angle—*Wysong & Miles Co, 625 Fulton St, Greenboro, NC*—Booth 1149

MORE DATA? Circle 290, inside back cover



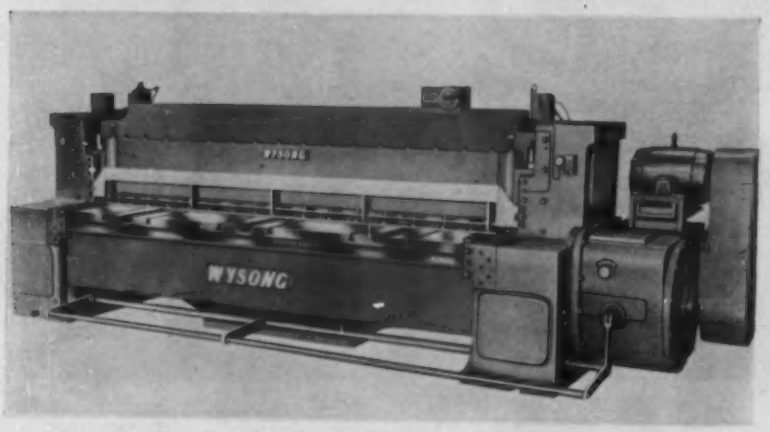
High-Speed Cincinnati Shear Cuts Off 24-in. Stock on Line

High-Speed shear operates at 200 strokes/minute and will make 125 cuts per minute on continuous cutoff work, when operated with reel stock. The machine has a spring-bar holddown and combination air clutch and brake. Upper knife has double rake.

Table height is 36 in.; overall machine height is 62 in. Power is through under drive with down cut. The machine has automatic pressure lubrication, all-steel welded and stress-relieved frame, and bolted construction that requires no foundation. The ram is inclined.

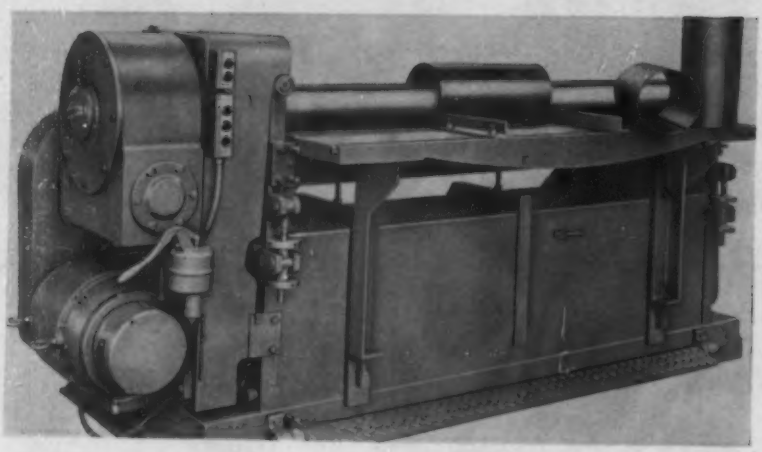
The Cincinnati Shaper Co, Box 111, Cincinnati 11, Ohio—Booth 1230

MORE DATA? Circle 291, inside back cover



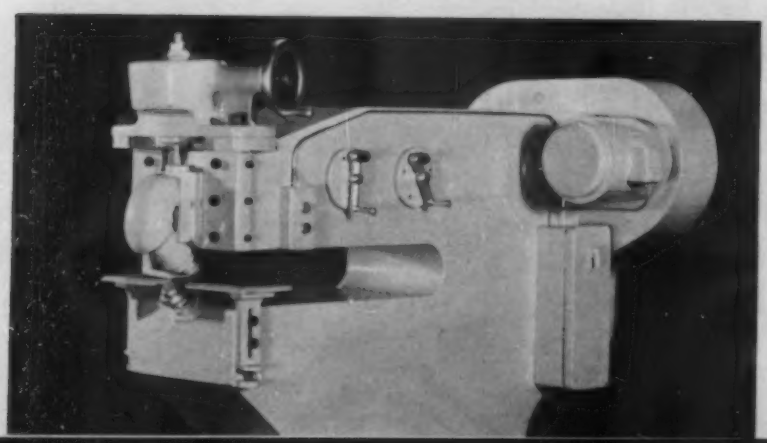
SQUARING SHEAR, Model 1250, has a capacity of ½-in. mild steel and a cutting length of 12 ft. Shear is equipped with two-speed, power-operated hinged back gage; and a new safety guard for the holddown — *Wysong & Miles Co, 625 Fulton St, Greensboro, NC*—Booth 1149

MORE DATA? Circle 292, inside back cover



BENDING ROLL, Model TC-672, will produce practically true cylinders, with the flat spots normally found on rolled cylinders virtually eliminated. Roll has 6-in.-dia rolls, working length of 6 ft., and a capacity of 12-gage mild steel. Shear is equipped with an automatic feed device and an automatic ejection unit to remove cylinders (AM/MM—Jan 11 '60, p113) — *Wysong & Miles Co, 625 Fulton St, Greensboro, NC*—Booth 1149

MORE DATA? Circle 293 inside back cover



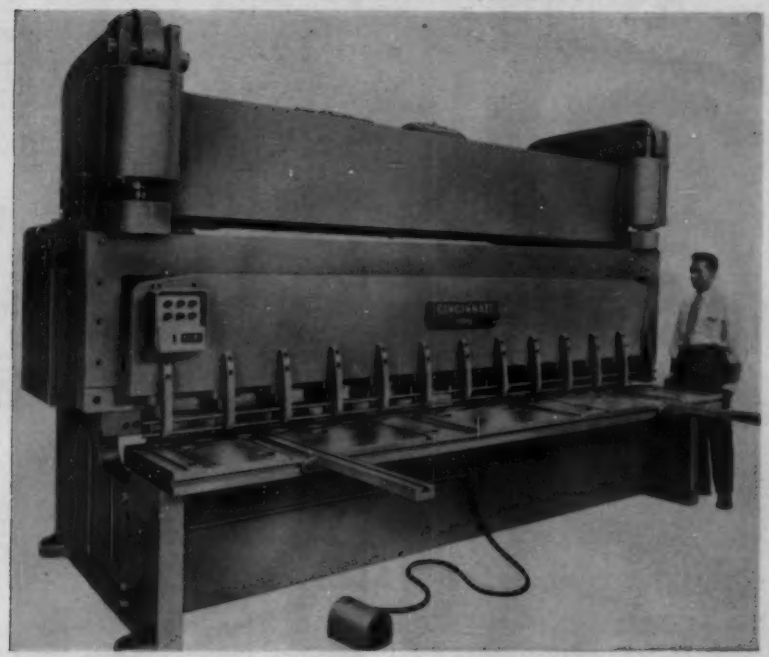
Quickword Rotary Shear Has Welded Frame, Higher Speeds

Redesigned Model 25A rotary shear has increased throat depth, higher cutting speeds, and a welded, instead of cast, frame.

Upper cutter head can be driven by handwheel and worm drive, or by motorized drive if desired. New design includes relocated motor and controls. Standard rotary-shear attachments can be fitted.

Beatty Machine & Mfg Co, Quick-Work Div, Hammond, Ind—Booth 243

MORE DATA? Circle 294, inside back cover



Cincinnati Hydraulic 4312H Plate Shear Permits Adjustable Rake

Hydraulic power is combined with features of standard mechanical shears in Series 4312H. The blade can be adjusted from 0 to ¾ in. taper per foot to allow cutting thin gages to ¾ in. x 6 ft mild steel. Typical rake settings: ½ in. for ⅝ x 12-ft mild steel, ⅜ in. for ½ in. x 12 ft mild steel, and ¾ in. rake for ¾ in. x 6 ft mild steel.

Cutting speed is 135 ipm; return is 290 ipm. Controls include pedal "inch" and continuous motions, front-controlled power back gage with 48-in. range, light-beam shearing gage. Lubrication is automatic.

Cincinnati Shaper Co, Box 111, Cincinnati 11, Ohio—Booth 1230

MORE DATA? Circle 296, inside back cover

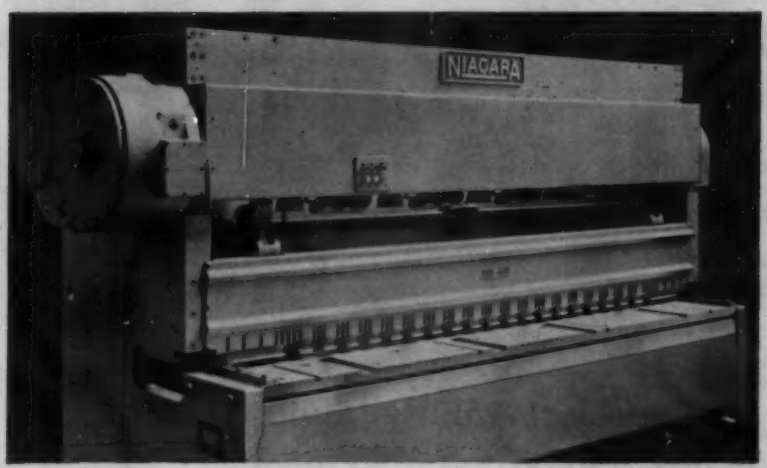
Hill Acme No. 500 Bar-Billet Shear Cuts up to 4½-in. Round

This shear, with a capacity of cutting bars up to 4½-in. round or 4-in. square, has a steel weldment base which has been thoroughly stress relieved. The cast steel knife seat and lever arm are of the same design as in the entire line of Hill Acme bar-billet shears.

The 36-in. knife provides the 500 with the ability to shear a wide range of sizes without knife change. Also, because a 12-in. knife can be mounted, tooling costs for high production can be lowered. The shear has a free running speed of 35 cuts per min and is available in right or left hand models.

The Hill Acme Co, 1201 W 65th St, Cleveland 2, Ohio—Booth 1240

MORE DATA? Circle 295, inside back cover



NIAGARA OVERDRIVE POWER SQUARING SHEAR has 18-in. gap, 144-in. length, and ½-in. capacity—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

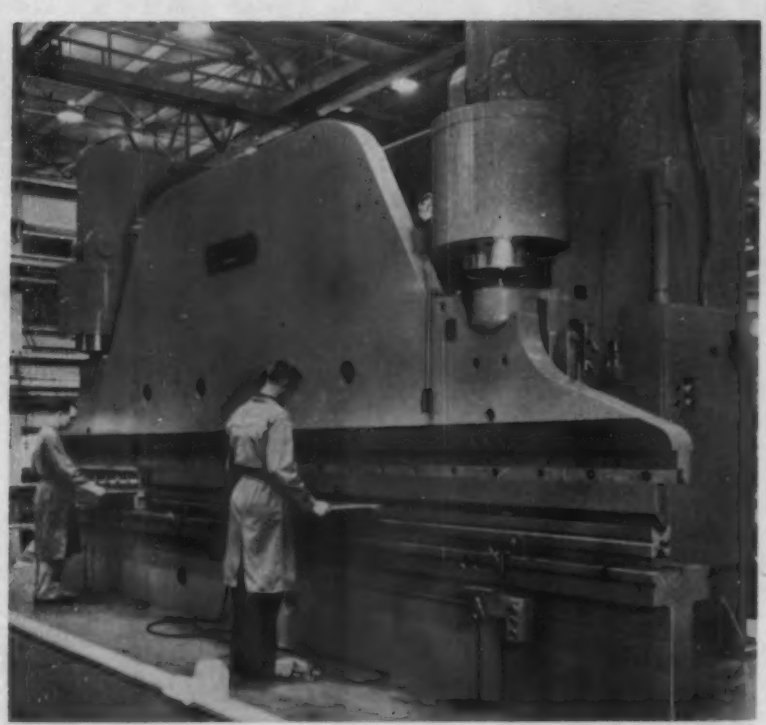
MORE DATA? Circle 297, inside back cover

EXHIBITORS SHOWING BENDING AND SHEARING EQUIPMENT

BOOTH	EXHIBITOR
1406	American Steel Foundries Elmes & King Divisions Cincinnati 29, Ohio
551	Buffalo-Forge Co Buffalo 5, N Y
1230	The Cincinnati Shaper Co Cincinnati 11, Ohio
814	The Cleveland Crane & Engineering Co Wickliffe, Ohio
1134	Dreis & Krump Manufacturing Co Chicago 36, Ill
1240	The Hill Acme Co Cleveland 2, Ohio
352	Johnson Machine & Press Corp, Div of Bontrager Corp
542	Lake Erie Machinery Corp Buffalo 17, N Y
1046	The Lodge & Shipley Co Cincinnati 25, Ohio
1330	Niagara Machine & Tool Works Buffalo 11, N Y
1149	Wysong & Miles Company Greensboro, N C

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Forming, Forging, Punching



750-Ton Cincinnati Hydraulic Press Brake Bends ¾-in. x 14-ft Mild Steel

Capacity of 750H x 16-ft Cincinnati press brake is ¾-in. x 7-ft mild steel over a 7-in. die opening. The machine has 24 ft of die surface available on a bed with top width at 16 ft. The throat is 18 in., stroke is 12 in., and open height is 22 in.

Ram speeds are 85 ipm on rapid advance, 53 ipm on fast press, 21 ipm on full-tonnage press, 39 ipm on return, and 63 ipm on fast return. Slides and guides have automatic lubrication. Bed and ram are micro-crowned. Equipment includes JIC tubing and welded connections, three-position pedal for "inch" and "run," and ram-direction indicators.

Taper adjustment to ram is made with self-adjusting swivel end-guide bearing and micrometer register of tilt within 0.001 in. A dial tonnage indicator is included.

Cincinnati Shaper Co, Box 111, Cincinnati 11, Ohio—Booth 1230

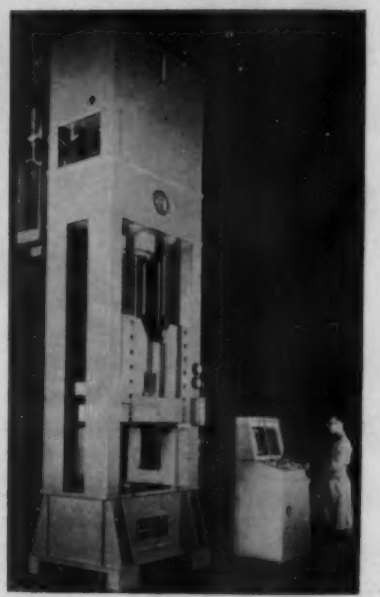
MORE DATA? Circle 298, inside back cover

L & J Press, with Meehanite Cast Frame, Has Balanced Design

A new press in the line with frames cast from Meehanite, this No. 90 OBI provides strength reqiured for its greater throat depth and bolster area. A balanced design is achieved with a heavy duty crankshaft, pitman, slide, and other parts.

L & J Press Corp, Elkhart, Ind—Booth 1116

MORE DATA? Circle 299 inside back cover



HPM 200-Ton Blankholder Press Has Complete Electronic Control

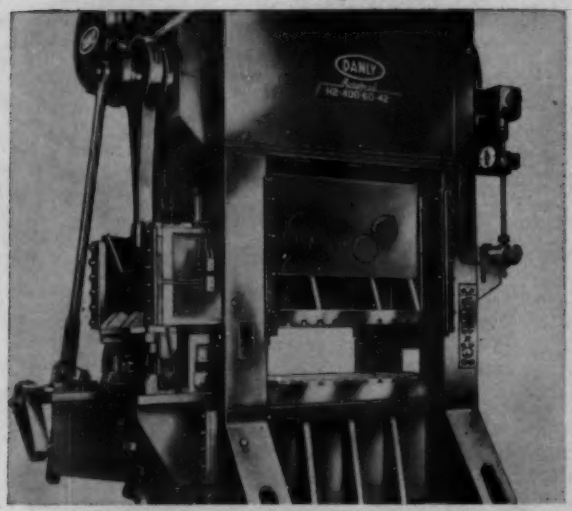
This 200-ton, triple-action press, the largest machine being shown by HPM, is equipped with complete electronic servo controls. As a standard option, tape or punched card control can be substituted for a human operator.

The controls permit infinite adjustment—at the operating console—of ram speed, daylight, stroke, and programming of speed changes at predetermined positions. It is never necessary for the operator to leave his station to make a press adjustment.

The ram position is infinitely adjustable through all ranges of speeds and positions for setting up any desired cycle-curve required for a given pressing operation.

Hydraulic Press Mfg Co, Div of Koehring Co, Mount Gilead, Ohio—Booth 1011

MORE DATA? Circle 300, inside back cover



DANLY 400-TON AUTOFEED PRESS will be exhibited complete with slide cushion, skip-type scrap cutter, a grip feed (adjustable while in motion), and a coil loading car. Other features on the press include hydraulic overload, slide positioner, load indicator, and die light—*Danly Machine Specialties, Inc, 2100 S Laramie Ave, Chicago 5, Ill*—Booth 1250

MORE DATA? Circle 301, inside back cover

Minster Offers Portable Presses In 150—500 Ton Capacities

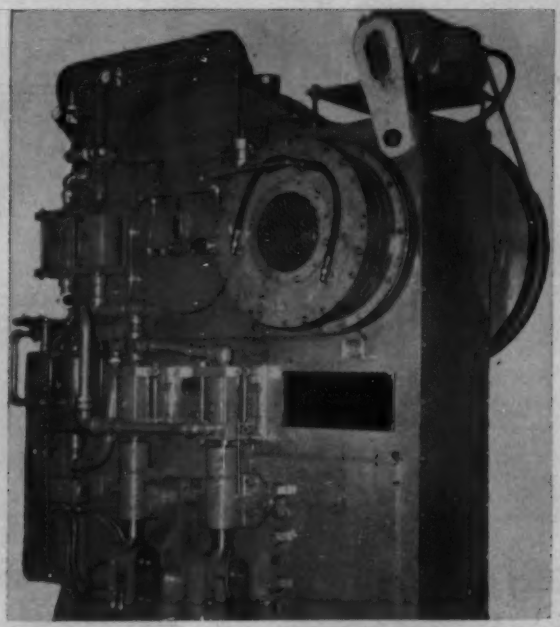
This S2-200 straight side two point press has the combination air friction clutch and brake unit mounted on the intermediate shaft for high single cycle efficiency. It is portable—just one air connection and one electrical power entrance. No pits are required.

Electrical, air ,and lubrication systems are complete and located within the press uprights. Other features: equipped with ViscoMatic recirculating oil lubrication system; point of stroke indicator and two die cushions with guided pressure pads mounted in bed two speed operation is optional.

Available in single or double geared, the press comes in capacities of 150—500 tons.

Minster Machine Co, Minster, Ohio—Booth 1339

MORE DATA? Circle 302, inside back cover



New Buffalo Billet Shear Provides Continuous Production Cutting at 60 Strokes per Minute

The new Buffalo 400 Billet Shear operates at speeds up to 60 strokes per min (free running). It handles billets up to 4-ft sq, rounds up to 4½-in. dia, flat bars up to 12 x 2 in. and will function continuously at full capacity on any shearable material.

Ram tonnage of this new shear is 400 tons, stroke is 2 in. Because both knife blades can be removed from rear of machine, changing is simple. The number of openings in the knives may vary according to size of bars being sheared.

In order to assure continuous high speed cutting, the mass and weight of the new frame are approximately twice that of previous designs. The 400 has electrical controls and an air-operated automatic oiling system.

Buffalo Forge Co, Dept 4, 490 Broadway, Buffalo 5, NY—Booth 551

MORE DATA? Circle 303, inside back cover

Wilson Automatic Hydraulic Presses Compact Refractories, Abrasives, Powdered Metals

Line of automatic opposed-ram compacting presses is designed for compacting of refractories, abrasives, and powdered metals where uniform density is a prime requirement. The 100-ton-capacity model illustrated can produce five pieces per minute of parts 1½ in. thick at 2:1 compression ratio. It is suitable for parts up to 8 in. in diameter with 1-in. wall thickness of tooling.

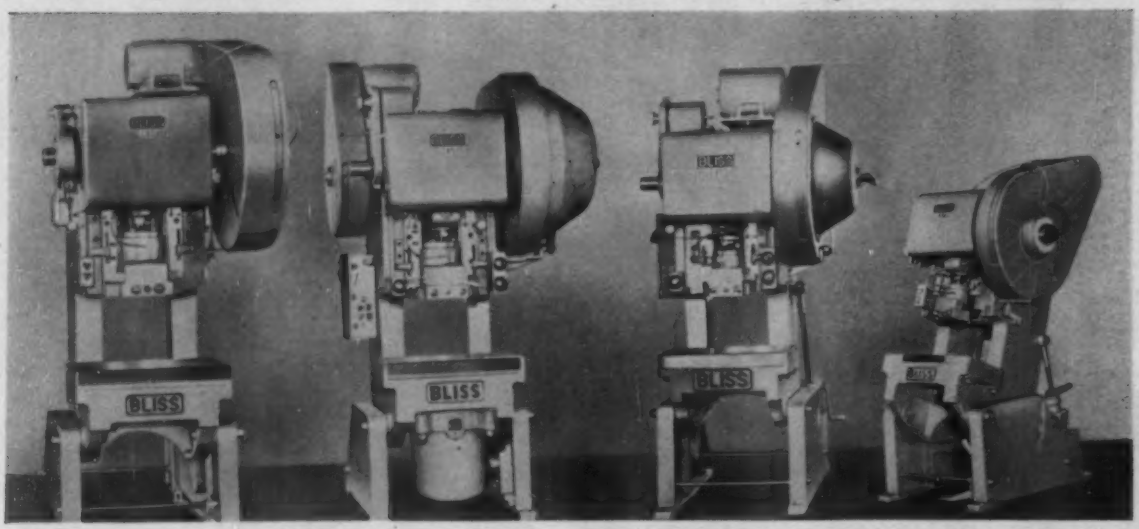
Press has a top ram stroke of 10 in., daylight of 16 in. from top ram to platen, working height of 42 in., and a charge-box stroke of 20 in. The bottom ram has a stroke of 6 in., and depth of fill is adjustable up to 4 in.

The material hopper is fixed to the back of the press and is provided with an agitator as well as a vibrator. It is equipped with a positive cylinder-actuated gate which shuts off after loading the charge box.

All press controls are grouped on the main control panel at the operator's position and are arranged for jogging, for setup, as well as for fully automatic cycling.

K R Wilson, Inc, Arcade, NY—Booth 1444

MORE DATA? Circle 304, inside back cover



Big "C" Inclinable Punch Presses Have 50% Less Deflection

Inclinable presses in capacities of 60, 45, 35, and 22 tons have redesigned Meehanite frame castings for improved rigidity to result in more uniform front-to-back pressure and a higher degree of parallelism between punch and die. Crankshafts are larger than normal, with 25-30% larger diameters at the crankpins. Bed openings, throat depths, and space between uprights are all increased over older models.

Larger sizes have longer slide adjustments with easier adjustment and stronger locking. Ball-type connection screw is similar to that on high-production presses. Bronze ball seat and ball cap, both larger, provide full working surface for connection screw. Ball clearance can be easily maintained with laminated shims. Laminated bronze V-gibs on all models combine smooth action and high wear resistance.

Options on lubrication include a fully automatic recirculating oil system, a semi-automatic Bijur system, or standard hand pump. Air and oil systems are located within the press for protection, but maintenance accessibility is good.

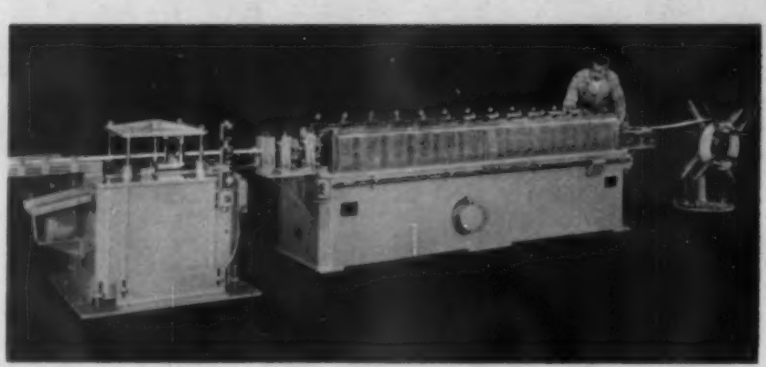
A portable inclining mechanism, either worm-gear or ratchet, will handle a line of similar presses to replace separate units for each press.

Press controls have been redesigned into a box 14 in. wide by 18 in. high, located on left side of press with buttons facing operator. Settings include those for run, stop, jog, and for continuous or single-stroke operation.

CK air friction clutch is available, mounted on the crankshaft. This has fast action through only an inch of motion from run to full stop. A rolling key clutch is also available, also mounted on the crankshaft with engaging surfaces close to the shaft axis. Flywheel wear is reduced because the bronze bearings do not ride directly on the crankshaft.

E W Bliss Co, 1375 Raff Road, Canton 10, Ohio—Booth 1325

MORE DATA? Circle 305, inside back cover



Maplewood Roll Forming Machine, and Cut-Off Designed for Heavy Duty

This new heavy duty model NMR-12 roll forming machine, and the new model No. 2 high speed cut-off machine, increase output and cut costs in roll forming lock seam tubing, acoustical ceiling sections, aluminum window screen sections, drawer slides, and an aluminum siding.

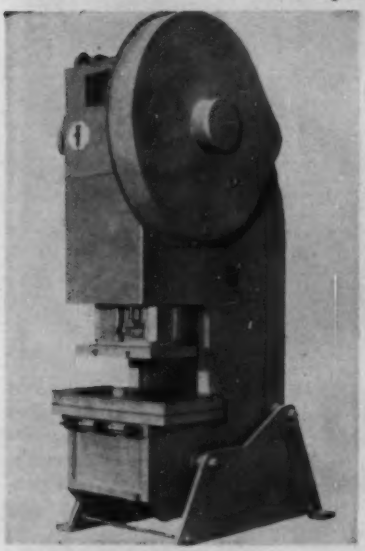
This unit has been specifically designed and engineered for heavy duty and high production. The forming machine has magnetic starter, 2 push button stations, full length jog bar, direct chain drive with double power take-off, micrometer dial type individual upper spindle adjustments.

Other features: 40—120 fpm forming speeds, 12 forming stations, 4—5 in. vertical distance between spindles, 10-in. horizontal distance between spindle, 1½-in. dia spindles, 14-in. roll displacement.

The No. 2 high speed cut-off is designed for high production operations and produces accurate sections every time.

Rockford Machine Tool Co, Rockford Ill—Booth 1001

MORE DATA? Circle 306, inside back cover

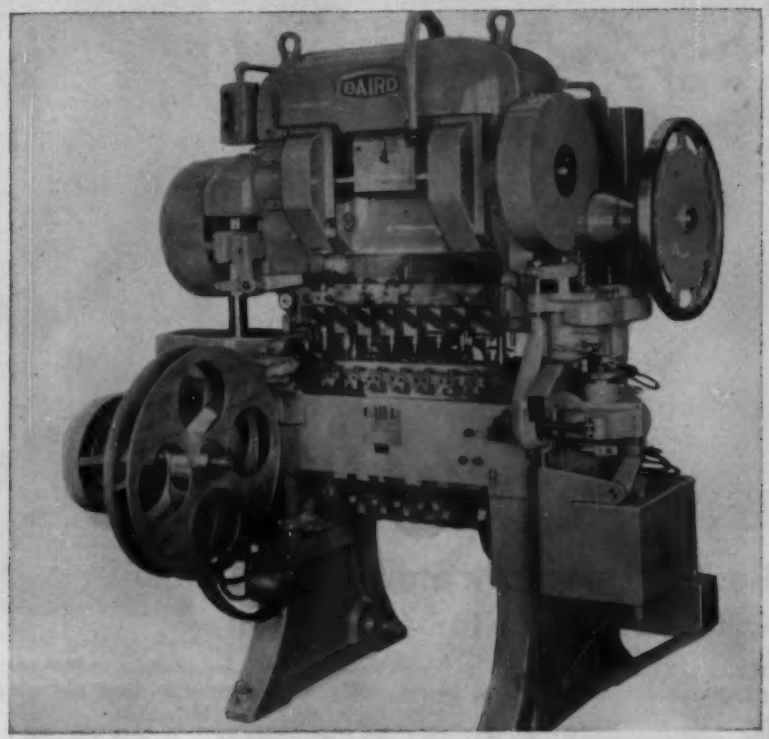


Ferracute OBI Press Offers Many Time-Saving Features

This new single-geared OBI mechanical press, of all steel construction, has many time-saving features. Among them are: formica lined gibs and long gib ways to give accurate alignment of the box-type slide; fully guided, large diameter, long barrel-type adjusting screw and pneumatically balanced slide to give quick adjustment of slide from floor level; air friction clutch and brake assembly which is specifically designed for severe clutch and brake applications of heavy duty equipment.

Ferracute Machine Co, Bridgeton, NJ—Booth 1122

MORE DATA? Circle 307, inside back cover



Longer Stroke, Electric Clutch Brake, Roll Feed on Multiple Transfer Press

Improvements on multiple transfer presses include: longer ram stroke for deeper draws and greater range of parts, electric clutch brake that stops the machine in ½ revolution, an easier-maintained roll feed, and Empco-bronze bushings in the transfer-finger bearing for longer life. The roll feed and mounting shaft are one piece, which permits easier maintenance. Improved bushings in the transfer slide give more accuracy over a long period of working life.

The Baird Machine Co, 1700 Stratford Ave, Stratford, Conn—Booth 1142

MORE DATA? Circle 308, inside back cover

EXHIBITORS SHOWING FORMING, FORGING, PUNCHING EQUIPMENT

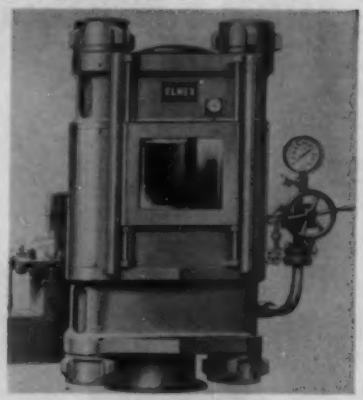
BOOTH	EXHIBITOR
1406	American Steel Foundries Elmes & King Divisions Cincinnati 29, Ohio
1142	The Baird Machine Co Stratford, Conn
641	John S Barnes Corp Rockford, Ill
243	Beatty Machine & Mfg Co Hammond, Ind
1325	E W Bliss Co Canton 10, Ohio
1034	The Cincinnati Milling Machine Co, Machine Tool Division Cincinnati 9, Ohio
1230	The Cincinnati Shaper Co Cincinnati 11, Ohio
814	The Cleveland Crane & Engineering Co Wickliffe, Ohio
1250	Danly Machine Specialties, Inc Chicago 5, Ill
914	Denison Engineering Div, American Brake Shoe Co Columbus 16, Ohio
331	Famco Machine Company Kenosha, Wisconsin
1122	Ferracute Machine Company Bridgeton, New Jersey
541	Greenerd Arbor Press Co Nashua, N H
652	Hannifin Co, A Div of Parker-Hannifin Corp Des Plaines, Ill
1240	The Hill Acme Co Cleveland 2, Ohio
1011	The Hydraulic Press Mfg Co, A Div of Koehring Co Mount Gilead, Ohio
352	Johnson Machine & Press Corp, Div of Bantrager Corp Elkhart, Ind
1339	Minster Machine Co. Minster, Ohio
1330	Niagara Machine & Tool Works Buffalo 11, N Y
842	U S Tool Company, Inc Ampere (East Orange) N J
1120	Walsh Press & Die Div of American Gage & Machine Co Chicago, Ill
1249	Wiedmann Machine Co King of Prussia, Penn
1444	K R Wilson, Inc Hydraulic Div Arcade, N Y

Beatty-Quickwork Stamping Trimmer Cuts 3/16-in. MS to 3/8-in. Radii

Model 43HVX is a redesigned two-spindle trimming machine with standard spindle speeds at 9-20 rpm and cutting speed of 15-33 fpm. Improvements include new and relocated air reservoirs for the pneumatic holddown, and improved electrical controls. Tooling and attachments may be added.

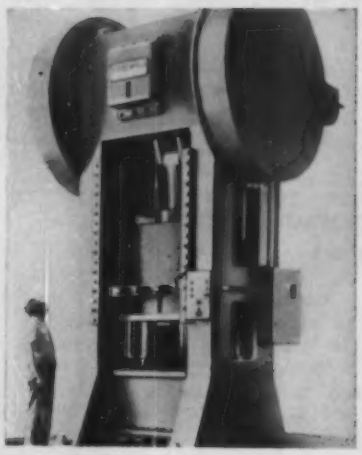
Beatty Machine & Mfg Co, 940-150th St, Hammond, Ind—Booth 243

MORE DATA? Circle 309, inside back cover



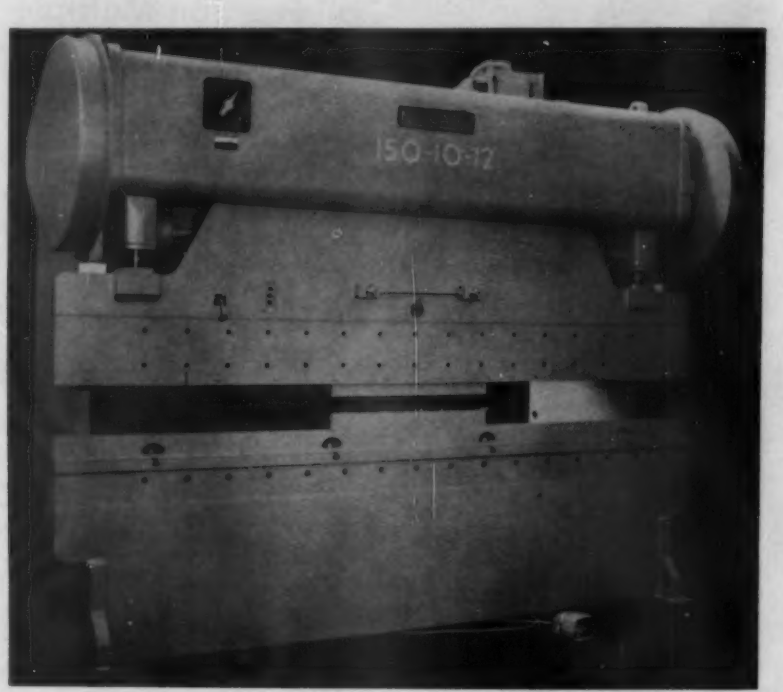
HOBBING PRESS, 1000 ton, features a timed compression and decompression cycle that makes the press very adaptable to compacting powdered metals, atomic energy applications, and production of synthetic products requiring high pressures under extreme heating conditions. It is fully hydraulic for smooth, powerful operation with simplified control—*Elmes/King Division, American Steel Foundries, Cincinnati 29, Ohio*—Booth 1406

MORE DATA? Circle 311, inside back cover



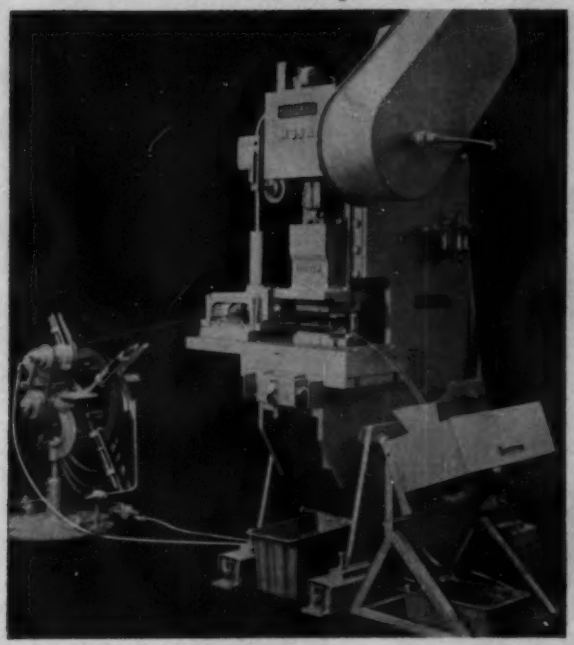
LINE OF SPEED-DRAW mechanical presses incorporates a simple toggle-eccentric mechanism that travels the slide at an essentially uniform rate during downstroke and at a much increased rate during upstroke. (AM—Oct 19 '59, p186)—*Cleveland Crane & Engineering Co, Steelweld Machinery Div, Wickliffe, Ohio*—Booth 814

MORE DATA? Circle 310, inside back cover



NIAGARA 150-TON MECHANICAL PRESS BRAKE is equipped with alternating two-speed control and die for bending long sheets (AM/MM—Feb 8 '60, p154)—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

MORE DATA? Circle 312, inside back cover



NIAGARA ULTRA-HIGH-SPEED OBI PRESS is fully automatic and operates at up to 1000 strokes/min to produce parts at a million a day—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

MORE DATA? Circle 313, inside back cover

Wilson Semi-Automatic Hydraulic Trim Presses Available in Capacities from 10 to 50 Tons

Line of 4-column, semi-automatic, hydraulic presses is designed for trimming operations on die-castings, plastics, and rubber. These single-action downstroke presses are available in capacities from 10 to 50 tons, and are controlled by pushbuttons located on the control panel at the right front of the press. Selector switch provides jog or semi-automatic operation; limit switches control ram stroke.

Specifications include maximum stroke of 18 in.; daylight of 26 in.; shutheight of 8 in.; work area of 30 in. R-to-L, 20 in. F-to-B; hole in bed 18 in. R-to-L, 12 in. F-to-B; a working height of 34 in.; and an overall height of 112 in.

Differential closing speed is 660 ipm; closing speed, 300 ipm; pressing speed, 130 ipm; and return speed, 660 ipm.

Moving-platen design of the telescoping type gives maximum strength and guide length. Though designed primarily for trimming, these presses can be used for other low-tonnage operations.

K R Wilson, Inc, Arcade, NY—Booth 1444

MORE DATA? Circle 314, inside back cover

General-Purpose Hydraulic Press Line Introduced by K R Wilson

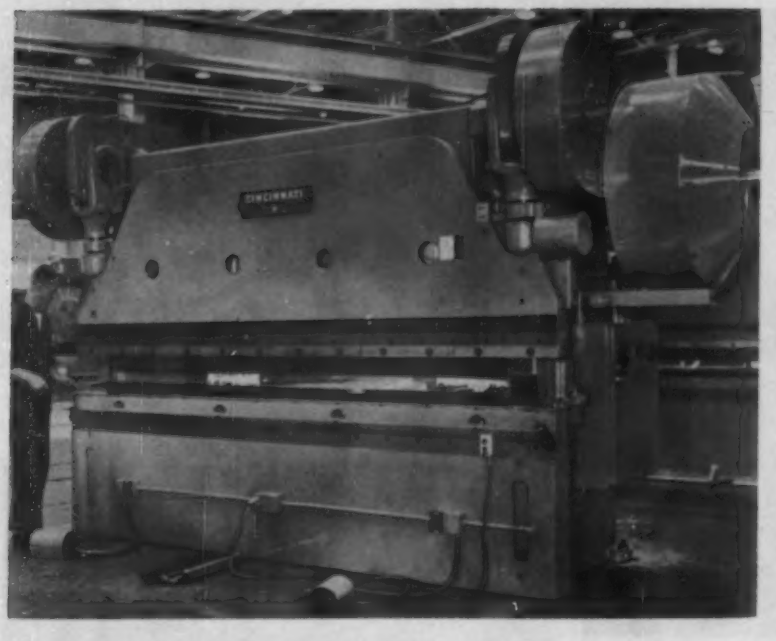
KRW 3700 Series self-contained general-purpose hydraulic presses are available in capacities from 75 to 300 tons. Press shown here has a maximum capacity of 200 tons and a stroke of 18⅞ in.

This single-action downstroke press has a closing speed of 73 ipm maximum, pressing speed of 12 ipm maximum, and a return speed of 70 ipm maximum. Other specifications include daylight of 20¾ in. minimum, 32¾ in. maximum; work area of 36⅝ in. R-to-L, 28 in. F-to-B; overall height of 108¼ in.

Distance between frames, R-to-L, is 42 in. clear; between bed plates, F-to-B, 14½ in.; between tension members, F-to-B, 12½ in. Pumping unit uses a 10-hp double-end motor. Control of press is by a hand-lever located at the right side of the press. It can be moved to decrease the speed of the ram.

K R Wilson, Inc, Arcade, NY—Booth 1444

MORE DATA? Circle 315, inside back cover



Cincinnati 9 Series Automatic Cycle Press Combines Slow Bending, Fast Cycling

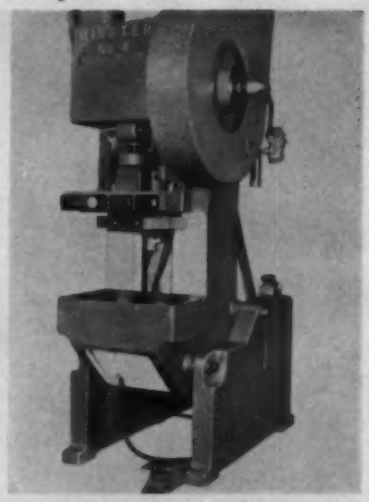
Fast cycle action without "back bends" and "whip-up" is the feature of Cincinnati's 9 Series x 10-ft automatic press. The machine will handle ¼-in. x 13-ft mild steel. It features automatic cycle control with dual clutches, air-electric clutch control, fail-safe brakes, and six control positions with lockout.

The two-speed transmission produces 30 or 7 strokes per min. Settings are made with two micrometer ram-adjustment indicators. Power ram adjustment is made with push-button; ram-screw adjustment has automatic lock. The ram may be quickly adjusted to tilt for fadeout work.

Stroke is 3 in., die space is 12 in., throat is 8 in.; bed and ram are micro-crowned.

Cincinnati Shaper Co, Box 111, Cincinnati 11, O—Booth 1230

MORE DATA? Circle 316, inside back cover



Minster Open Back Inclinable Presses Range from 12—75 Tons

A new line of OBI presses, which range in capacity from 12—75 tons, have a leg and frame design which provides more knee and foot room for the operator. An easily operated inclining arrangement is built into the press leg leaving all clear space for material handling under the machine.

This new OBI is equipped with the Minster patented combination air friction clutch and brake unit.

New features include: ViscoMatic recirculating oil lubrication system; built-in centralized press controls with Cycle-Mite clutch control; enclosed frame top for greater rigidity.

Minster Machine Co, Minster, Ohio—Booth 1339

MORE DATA? Circle 318, inside back cover

Minster High Speed Gap Press Has New Base Design

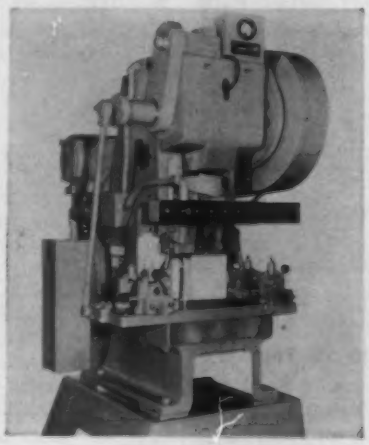
Model B1, ranging from 16—60 tons, features a new fixed base design for stability needed in high speed automatic operations. Variable speeds range from 400—800 spm.

Features of the new press are: high speed balanced crankshaft; snap-in bearings; flame-hardened gibs; light alloy metal slide; ViscoMatic recirculating oil lubrication system.

The frame top is boxed for maximum crankshaft rigidity, and controls are in a shock mounted cabinet. Feeds, controls, and drives can be supplied to fit the application.

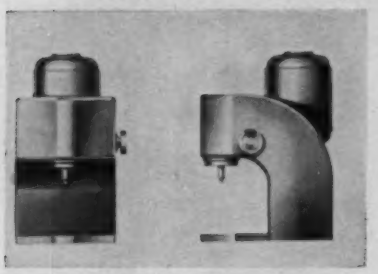
Minster Machine Co, Minster, Ohio—Booth 1339

MORE DATA? Circle 317, inside back cover



GENERAL PURPOSE, GUIDED PLATEN hydraulic press, for forming, bending, die tryout, moulding, has 40-ton capacity—*Greenerd Arbor Press Co, 41 Crown St, Nashau, NH*—Booth 541

MORE DATA? Circle 319, inside back cover

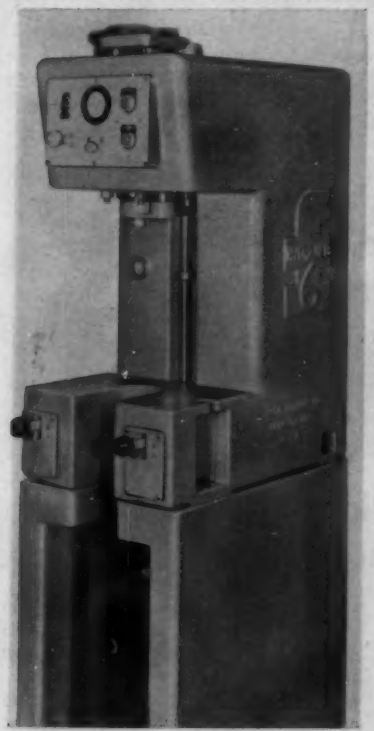


Barnes Portable Hydraulic Press Designed for Small Assembly Jobs

EJS portable press is designed primarily as an arbor press for small assembly jobs. It is 20 in. high, has a 4¾-in. throat, and a maximum stroke of 4 in. Thrust is adjustable from 50 to 5000 lb. Hand lever, pushbutton, foot, and fully automatic controls are available.

John S Barnes Corp, 315 S Madison St, Rockford, Ill—Booth 641

MORE DATA? Circle 320, inside back cover



Famco C-Frame Hydraulic Press Rated at 2 to 10-ton Capacity

New line of hydraulic presses has models with capacities of 2, 3, 4, 6, and 10 tons. C-frame construction is designed for maximum rigidity, minimum deflection, and ample work area.

All operating controls are grouped for easy reach. Those on the panel include pump-motor start and stop, pushbutton valve for quick pressure-gage reading, easily read pressure gage graduated in pounds and tons, and relief-valve adjusting knob for setting ram pressure.

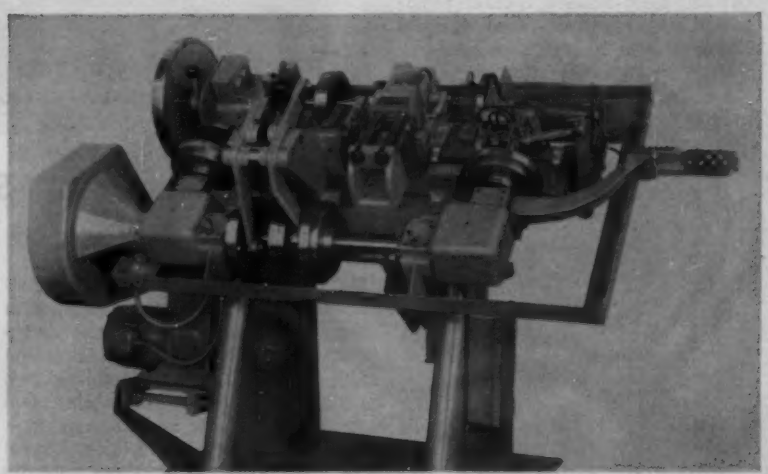
With this line, the company becomes the only press builder to offer all possible press types—manual, power, air, and hydraulic.

Famco Machine Co, Kenosha, Wis—Booth 331

MORE DATA? Circle 321, inside back cover

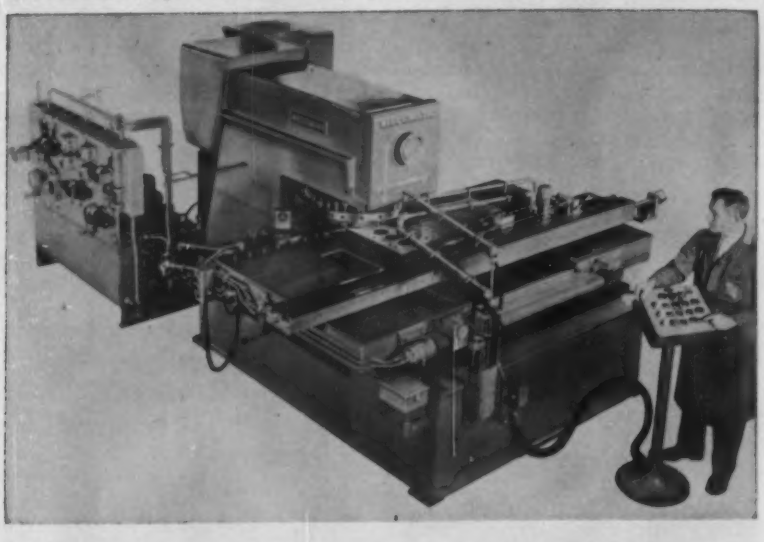
HYDRAULIC TRIPLE ACTION BLANKING PRESS, equipped with special die, produces smooth edge parts without any shaving operation. Burrs are greatly reduced, and parts, such as cams, may be used in assembly direct from press. This new unit operates with automatic roll feed or strip stock (AM/MM, July 25 '60, p98)—*Hydraulic Press Mfg Co, Div of Koehring Co, Mount Gilead, Ohio*—Booth 1011

MORE DATA? Circle 322, inside back cover



INCLINABLE 4-SLIDE WIRE-FORMING MACHINE is built to integrate with materials-handling, gaging, and other fabricating accessories. Bed tilts on pedestal legs from horizontal to vertical to improve scrap and part ejection, ease tooling adjustment, and increase size of parts ejected to front. Unit has 4-ton press capacity and will form 3/32-in. wire and ribbon up to 0.021 in. by 1½ in. wide (mild-steel). Maximum feed is 8½ in., speed is 75-340 parts per hr (see AM/MM—July 11, '60, p151)—*The Baird Machine Co, 1700 Stratford Ave, Stratford, Conn*—Booth 1142

MORE DATA? Circle 323, inside back cover



Wiedemann 15-Ton Turret Punch Press Locates & Pierces Holes at 60/min

Fastest numerically controlled turret punch press to date is this new 15-ton unit, which also changes tools during each second devoted to locating and piercing a hole.

Hole-size capacity of the A-15 is 3½ in. in 14-gage mild steel, and sheet-handling capacity is 30 x 48 in. and 3/16 in. thick. Press crankshaft speed is 200 strokes/min, and table motion is 500 ipm. The turret may carry from 26 to 72 different punches.

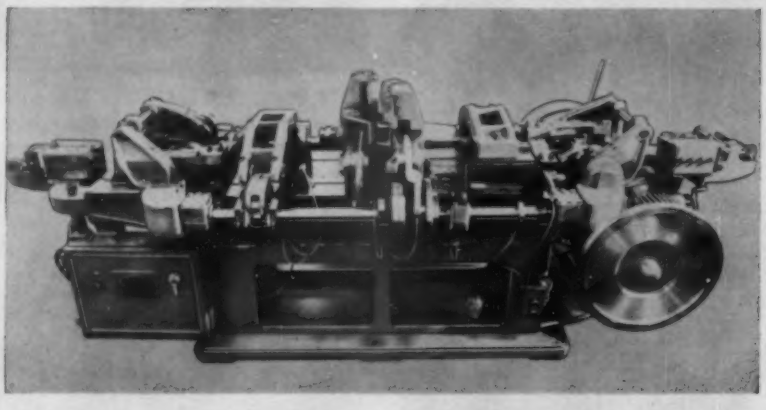
Control is through standard 8-channel 1-in.-wide punched paper tape that uses three-place decimal dimensions for X and Y coordinates and turret-station location.

Wiedemann Machine Co, Gulph Rd, King of Prussia, Pa—Booth 1249

MORE DATA? Circle 324, inside back cover

HYDRAULIC PRESS, 4-ton FD Series, is designed for high-speed assembly and trimming. Unit illustrated is equipped with a 20-in. index table—*Hannifin Co, Div of Parker-Hannifin Corp, Des Plaines, Ill*—Booth 652

MORE DATA? Circle 326, inside back cover



Double-Ended Multi-Slide Machine Accepts Coil Stock at Both Ends

Model MS-36D U S Duplex Multi-Slide can be fed at both ends, with the stock feeding in opposite directions. This arrangement is suited for producing and assembling two stampings, and for assembling two stampings (made in the machine) with a prefabricated, hopper-fed member. The machine can also be used for making two different stampings at the same time.

Machine is currently being made in one size, this suitable for material up to 3 in. wide and adjustable for feeding lengths up to 6 in. Standard machine is equipped with two stock straighteners, two slide feed mechanisms, two stock checks, one die head, one four-slide forming position, and one double-motion stripper unit.

When required, the machine can be equipped with an extra die head at each end, cutoff slide at each end, and rear auxiliary slide at each end. Also to be exhibited is the Model MS-28H high-speed multi-slide. It is essentially similar to the standard Model 28 but has been modified to operate at a speed of 400 strokes per minute.

U S Tool Co, Inc, Ampere (East Orange), NJ—Booth 842

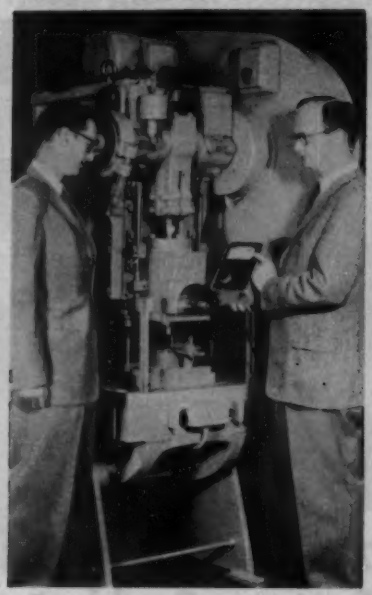
MORE DATA? Circle 327, inside back cover

FORM-ALL BENDING BRAKE forms intricate shapes without dies or tooling. It produces combinations of bends and one-piece parts impossible by any other standard method. (AM/MM—Apr 4, '60 p179)—*Lake Erie Machinery Corp, Buffalo 17, NY*—Booth 542

MORE DATA? Circle 325, inside back cover

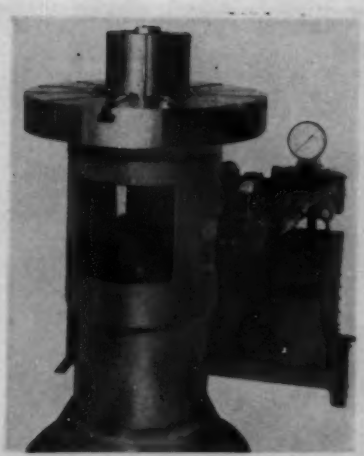
NIAGARA 400-TON HYDRAULIC PRESS BRAKE can be fitted with a variety of forming dies—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

MORE DATA? Circle 328, inside back cover



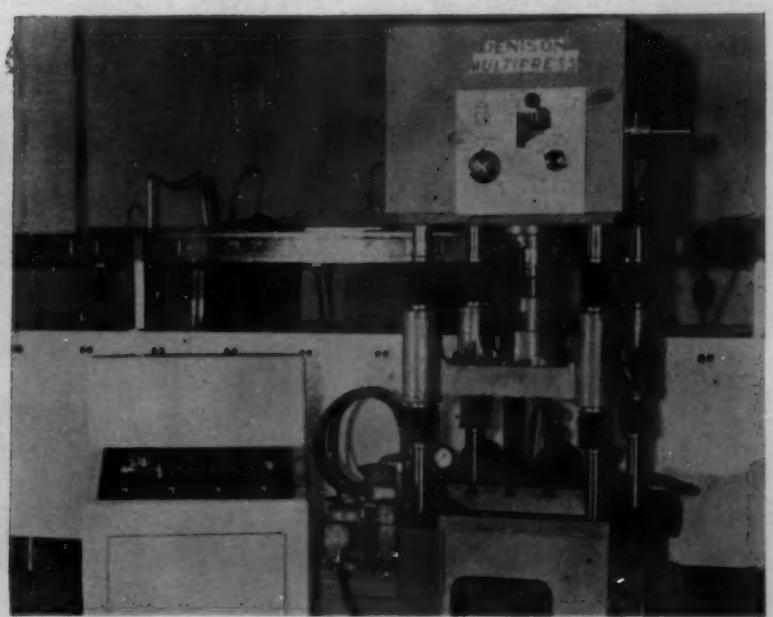
NIAGARA OBI PRESS with mechanical sleeve clutch is operated with a Niagara Tonmeter, a portable instrument for measuring frame strain during production run or setup (AM/MM—Nov 16 '59, p188)—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

MORE DATA? Circle 330, inside back cover



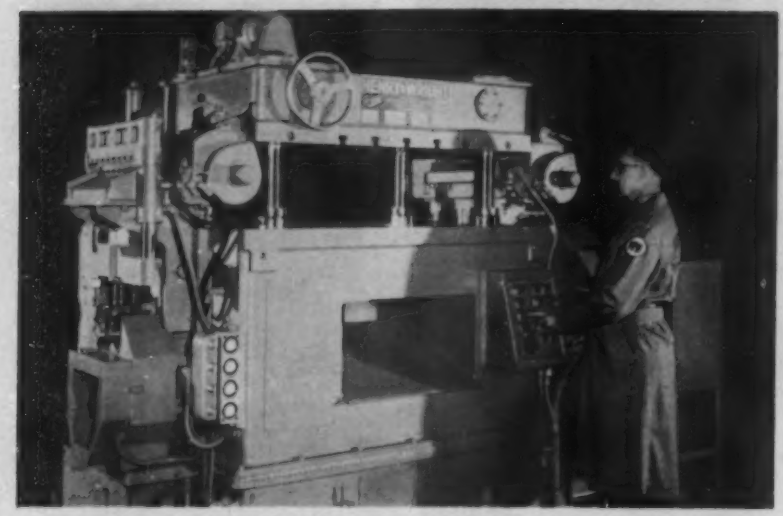
HYDRAULIC EXPANDING MACHINES, E-62, with a 62-ton maximum ram pull, and E-93, with a 93-ton maximum ram pull, can be furnished for stretch-forming metal cold or water-cooled for work with metal at high temperatures (AM/MM—Apr 18 '60, p145)—*Greenerd Arbor Press Co, 41 Crown St, Nashua, NH*—Booth 541

MORE DATA? Circle 329, inside back cover



DENISON 25-TON HYDRAULIC STAMPING PRESS is designed for high-speed stamping operations with progressive dies. It can deliver 600 ram storkes per minute, and is equipped with a separate electrical control console. Bed area between posts is 20x20 in. (AM/MM—Jul 11 '60, p150)—*Denison Engineering Div, American Brake Shoe Co, Columbus, Ohio*—Booth 914

MORE DATA? Circle 331, inside back cover



75-Ton Henry & Wright Dieing Machine Features Double-Crank Construction

A new high production Henry & Wright dieing machine, featuring double-crank construction, will be in operation at the Show. This standard press will be equipped with roll feed, scrap cutter, motor driven cross-head adjustment, recirculating lubrication, and thermo-switches on all main bearings for protection.

Also in operation will be a 25-ton single crank model which is equipped with roll feed and scrap cutter.

Hydraulic Press Mfg Co, Div of Koehring Co, Mount Gilead, Ohio—Booth 1011

MORE DATA? Circle 332, inside back cover

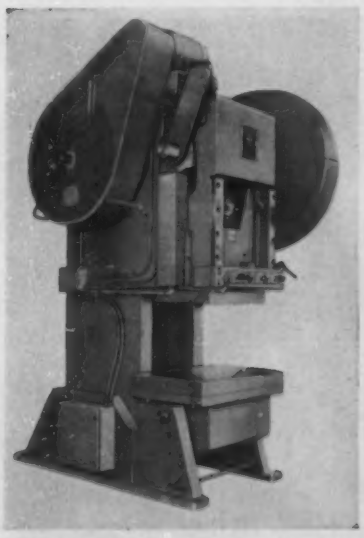
Greenerd Heavy-Duty Bench Press Cycles 36 Times a Min

A self-contained bench type press, this Model B-2 makes 36 four-inch cycles per min. Its 3 hp, 1800 rpm flange-mounted motor is coupled directly to the hydraulic pump. The press has ample horsepower for holding power on work, if required.

Rundown is 900 ipm, work speed is 176 ipm, and return is 300 ipm. The press receives 10½-in. diameter work with 11 in. of daylight.

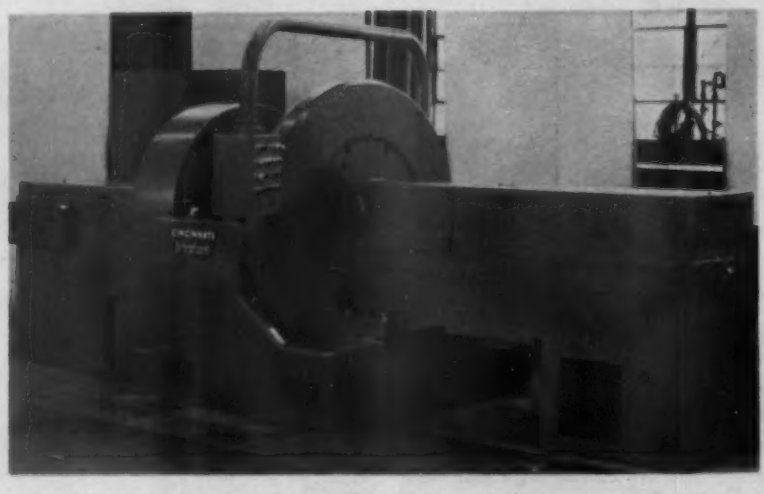
Greenerd Arbor Press Co, 41 Crown St, Nashau, NH—Booth 541

MORE DATA? Circle 334, inside back cover



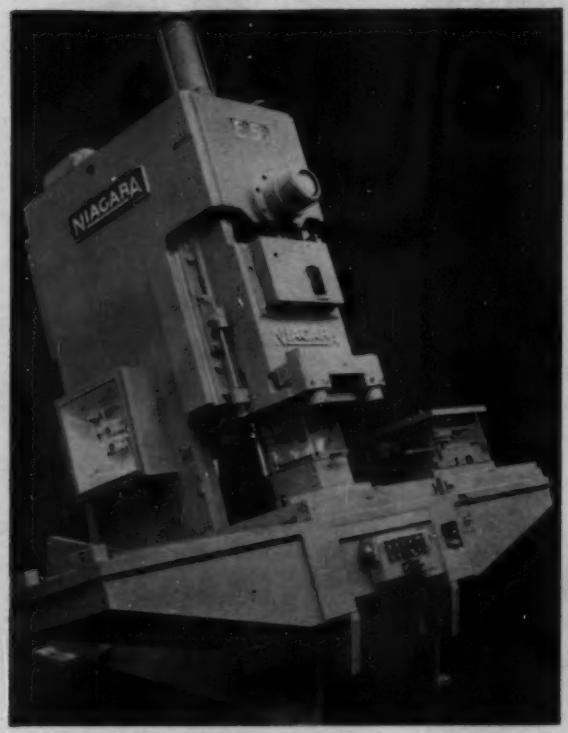
ENTIRELY NEW 125 ton press, of welded steel construction heavily reinforced for max strength and resistance to deflection, it has box slide, twin air counterbalances, and air clutch mounted on backshaft. Die capacity is 42 x 29 in.; shutheight is 18 in. —*L & J Press Corp, Elkhart, Ind*—Booth 1116

MORE DATA? Circle 333, inside back cover



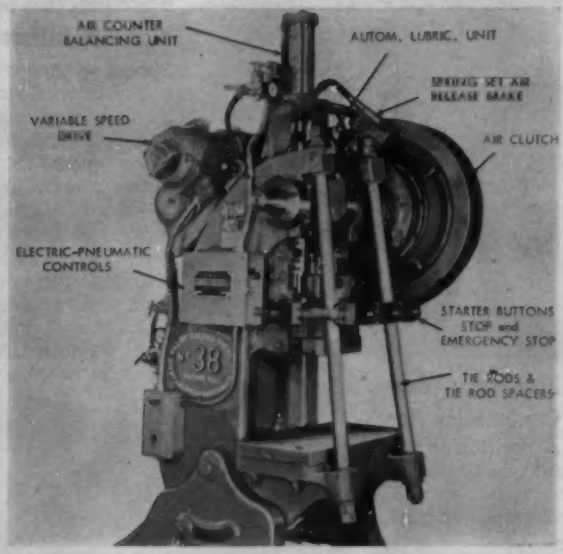
CHIPLESS MACHINING PROCESS performed in this Cincinnati Intraform machine forms starter clutch housings in one pass from screw-machine blanks. This 40-hp unit, Model H-200, can be tooled to form parts from blanks ⅜ to 3 in. in diameter. In operation, hollow cylindrical stock is placed over a mandrel and squeezed by rapidly pulsating dies. At completion of operation, profile of mandrel has been reproduced in the ID of part--*Cincinnati Milling Machine Co, Meta-Dynamics Div, Cincinnati 9, Ohio*—Booth 1034

MORE DATA? Circle 335, inside back cover



NIAGARA SLIDING-BOLSTER PRESS with front-to-back crankshaft and OBI construction is equipped for quick die change—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

MORE DATA? Circle 336, inside back cover

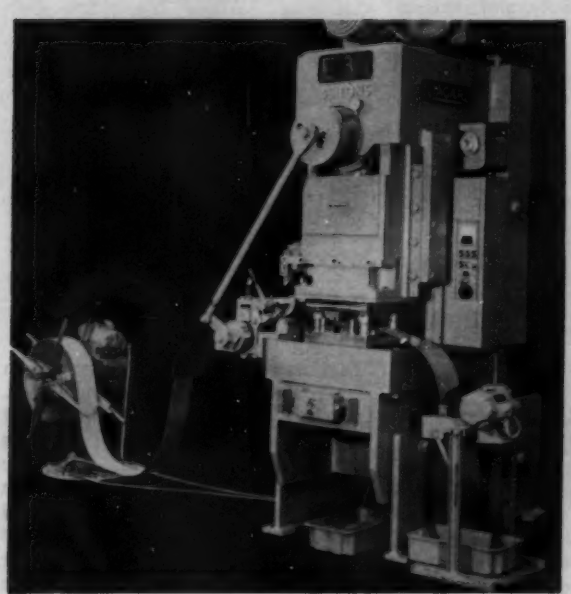


Walsh Automatic 38-Ton Punch Press Has Variable-Speed, Air Clutch

No. 38 punch press is equipped for high production rates, with air counterbalancing unit, electric controls, and air clutch and brake. It has electric inching, single-stroke and continuous operation, and hand or foot control. Emergency stop and precision-switch plug-ins are included.

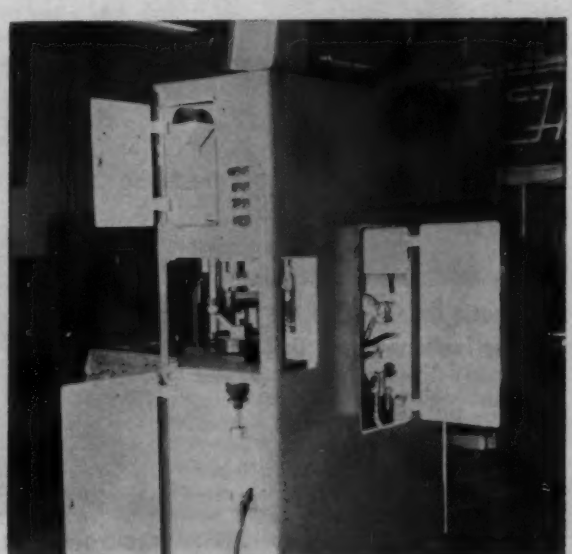
Walsh Press & Die Co, 4709 W Kinzie St, Chicago 44—Booth 1120

MORE DATA? Circle 338, inside back cover



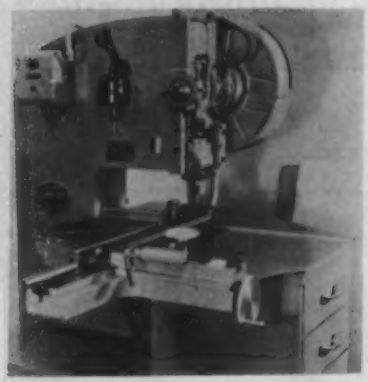
NIAGARA 45-TON OBI PRESS has automatic roll feed, stock reel, and scrap cutter for stamping fuse tips at a million/day—*Niagara Machine & Tool Wks, Buffalo 11, N Y*—Booth 1330

MORE DATA? Circle 337, inside back cover



AUTOMATIC HYDRAULIC COMPACTING PDESS, is specifically designed for compacting powdered metals, glass, and plastics. Press to be exhibited is tooled for volume production of tantalum capacitor anodes (*AM/MM*—Jul 11 '60, p154)—*Denison Engineering Div, American Brake Shoe C, Columbus, Ohio*—Booth 914

MORE DATA? Circle 339, inside back cover



Positioning Table, Bench-Press Combination Has 1-Min Setup

A positioning and piercing machine that will locate holes accurate within 0.001 in. and can be set up in under a minute is essentially a duo-dimensional positioning table and a Bliss punch press. The unit is for rapid adjustment of side and depth adjustments, and for notching and piercing sheet metal and fiber printed-circuit boards. The machine can also be applied for making templets.

E W Bliss Co 1375 Raff Rd, Canton 10, Ohio—Booth 1325

MORE DATA? Circle 340, inside back cover

Automatic Indexer of HPM Presses Is Accurate to 0.001 in.

Five-ton automatic press operates with the new automatic indexing table. This table is accurate within ± 0.001 in. at the die and will carry 100 lb at an indexing speed of 80 per min. This speed is infinitely adjustable down to 10 indexes per min.

Completely automatic in operation, this table may be fitted with automatic feeding and unloading accessories or manually loaded at speeds best suited to the parts.

Hydraulic Press Mfg Co, Div of Koehring Co, Mount Gilead, Ohio—Booth 1011

MORE DATA? Circle 341, inside back cover

Baird Machine Generates Springs Including Different End Loops

Spring winder with 0.008-0.34-in. capacity in wire stock will turn out as many as 6400 springs/hr with coils and both end loops formed at the same operation. The machine is claimed to cut in half the usual load tolerance in spring action, and will make end loops of many shapes.

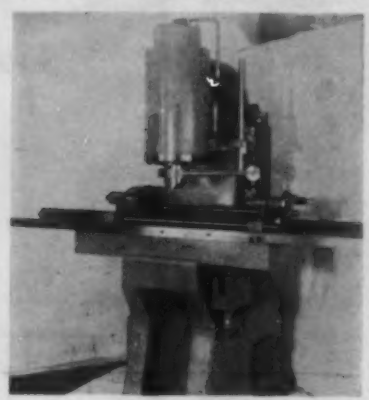
Forms are determined by easily-changed cams and feed change gears, that produce feed up to 26 in.

Baird Machine Co, 1700 Stratford Ave, Stratford, Conn—Booth 1142

MORE DATA? Circle 342, inside back cover

NO. 3-R LEVER RATCHET arbor press, for assembly, forming, keyway broaching, has 3-ton capacity and receives 12-in. diameter work—*Greenerd Arbor Press Co, 41 Crown St, Nashau, NH*—Booth 541

MORE DATA? Circle 343, inside back cover

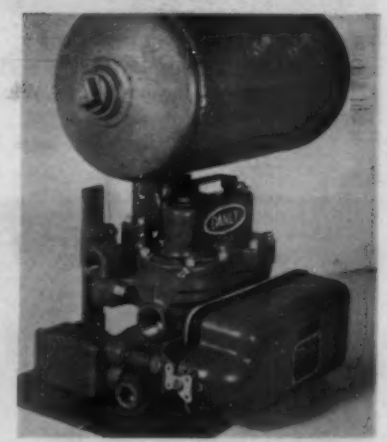


H-15-D HYDRAULIC PRESS, equipped with straightening table, variable ram pressure control, and electrically operated ram control, has 15-ton capacity. Press is also available in 2, 4, 6, and 10-ton models—*Greenerd Arbor Press Co, 41 Crown St, Nashau, NH*—Booth 541

MORE DATA? Circle 344, inside back cover

REDESIGNED 27 TON PRESS, with greater rigidity, now provides for operation at higher speeds. This small press has exceptional adaptability to a wide variety of work—*L & J Press Corp, Elkhart, Ind*—Booth 1116

MORE DATA? Circle 345, inside back cover



Rotary-Cam Limit Switch, Dual Air Valve Introduced by Danly

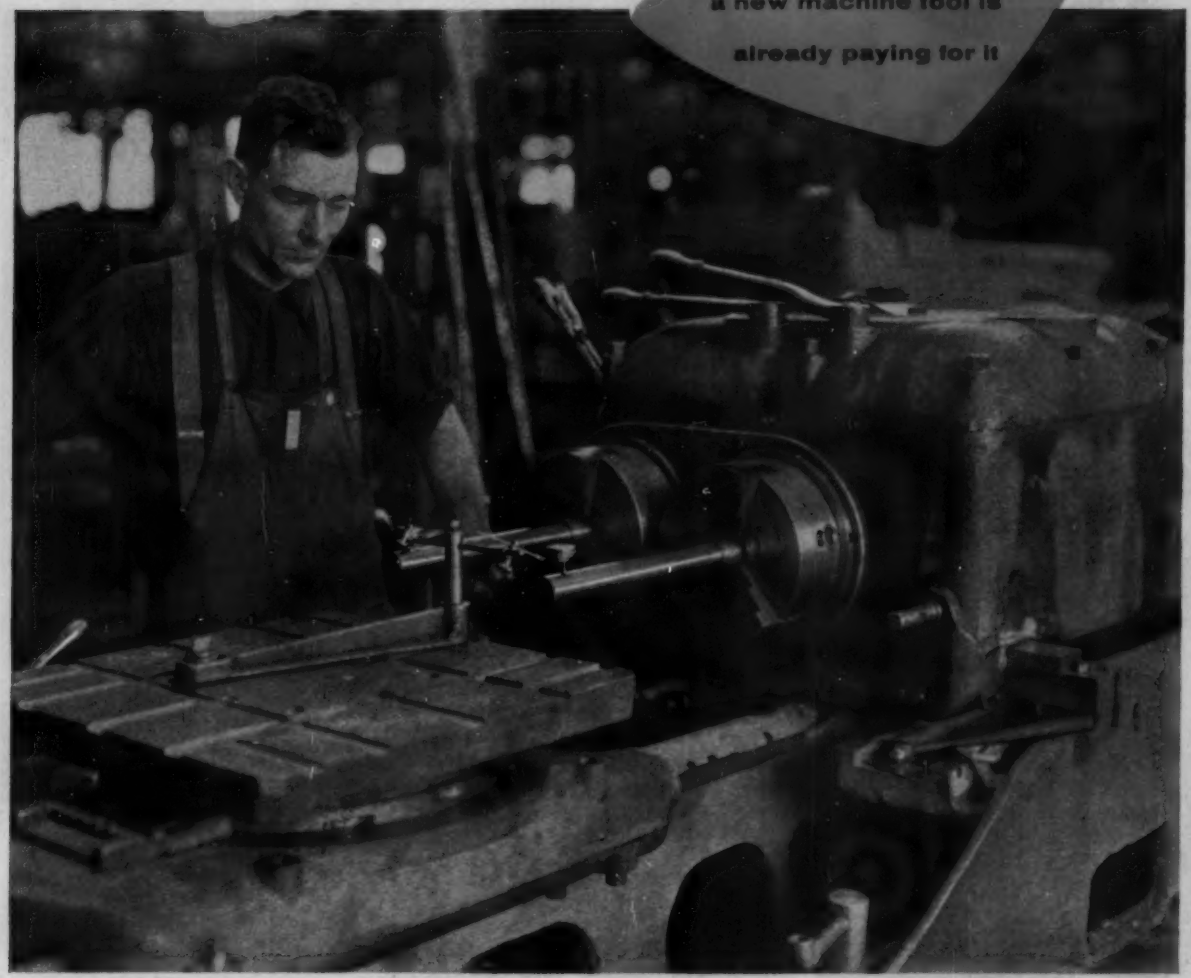
The new Danly 360° rotary-cam limit switch provides convenient, simple, and accurate control of electrical circuits. The switch is externally adjusted and can be operated in any position. When changing the switch setting ahead beyond the zero limit, this new unit need not be reversed. In other words, a setting change from 355° to 5° simply involves moving the adjustment ahead 10°.

Danly Machine Specialties, Inc, 2100 S Laramie Ave, Chicago 50, Ill—Booth 1250

MORE DATA? Circle 346, inside back cover

JONES & LAMSON MACHINE TOOLS

the man who needs a new machine tool is already paying for it



It's Useful . . . but is it still Profitable?

Provide competent people with the proper equipment, and you have the key to sustaining a sound, healthy business condition.

Incompetence in people is detected sooner than later, and they are replaced. It's the value of the equipment that fools most of us. Just because a machine still runs, possibly as well as when new, it's generally considered as useful. But it's not *usefulness* that brings home the bacon — it's *profitableness.*

New, improved methods, and the machines to implement these methods, are being created constantly. If your methods and equipment do not stay abreast of competition, at the least, you inevitably will be out-produced, out-priced, and out of business.

Most of the really good new machine tools now available to industry will pay for themselves in a short time, and will roll up profits besides. We think this is true for some other makes of machines — and we *know* it is true for each and every item in the complete line of Jones & Lamson equipment.

J & L machines are easier to acquire than you may think, too.

Investigate the new J & L Profitivity Lease Plan. It requires no money down, no advance payments — in fact, no payments of any kind are required until thirty days after the machine has been shipped.

Write to Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vt. for Machine Replacement and payment plans.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

Tools and Accessories

Kendex Milling Cutters Eliminate Grinding, Resetting of Blades

Standard ¾-in. square carbide inserts with eight indexable cutting edges eliminate grinding and resetting of cutter blades. Facilitation of indexing inserts is provided by double-acting lock screws in one-piece wedge-seats which also prevent loosened seats from falling out. A 15° peripheral cutting edge angle minimizes pressure on workpieces.

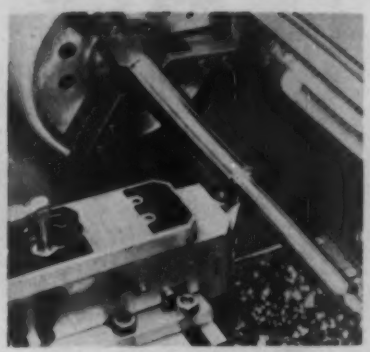
Cutter bodies are designed for heavy chip loads and high rates of metal removal.

Kennametal Inc, Latrobe, Pa — Booth 1500

MORE DATA? Circle 347, inside back cover

COMPACT PORTABLE AMPLIFIER with gage stylus that operates on 110-v, 60-cycle ac or battery power weighs 4½ lb and is 10 in. high. Three scale ranges for stylus deflection span 0.001 in., 0.0001 in., and 0.000,020 in.—*Sheffield Corp, Dayton, Ohio*—Booth 381

MORE DATA? Circle 348, inside back cover



Cleveland Machining Device Breaks Chips to Desired Size

This new Chipbreaker and Tool Booster, which fragmentizes chips to desired size, also lengthens cutting tool life. This device, according to the manufacturer, improves production output, increases machine capacity, reduces the cost of subsequent finishing, and simplifies size control problems.

Effective for single and multiple grooving as well as cutoff operations, the chipbreaker and tool booster will mount on all types of lathes, automatics, planers, shapers, etc.

Cleveland Hobbing & Machine Co, Div of Textron, Inc, 1311 Chardon Rd, Cleveland 17, Ohio—Booth 642

MORE DATA? Circle 349, inside back cover

Kendex Dial-A-Breaker Tooling Has Adjustable Chip Breakers

This tooling, with attached, adjustable chip breaker, permits wide-range chip control with standard triangular and square "throw-away" inserts and 3-part chip breakers assembly: carbide chip breaker plate with integral screw; adjusting nut or thumb dial; and lift spring. Assembly and setting are retained on holders in any position while changing inserts. There are 76 holder styles and sizes.

Kennametal Inc, Latrobe, Pa — Booth 1500

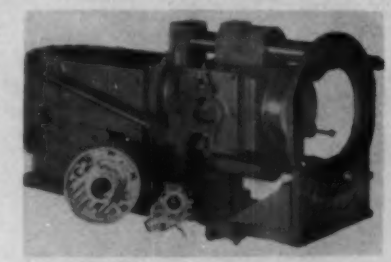
MORE DATA? Circle 350, inside back cover

Barnes Immersed Drum Filter

Heavy coolant flow in central coolant systems is handled by a pressure-type immersed drum filter. Capacities range from 150 to 1000 gpm.

Barnes Drill Co, Chestnut St, Rockford, Ill—Booth 152

MORE DATA? Circle 351, inside back cover



Kingsbury Oscillating Head Mills Notches Inside Workpiece

Model 167 oscillating head (driven by a model 16 drilling unit) mills oil pockets in the large holes of the transmission shaft support (left), and the governor body (center). It mills the notch in the connecting rod cap (right).

The oscillating head slides on guide rods. It is clamped on the quill of the drilling unit, so that it has the stroke of that unit. But the speed of the oscillating spindle is only half that of the drilling unit.

On the side of the drilling unit is a lever that is operated by the feed cam. This lever controls the oscillating stroke independent of the stroke of the quill. The spindle, which has a max stroke of 30°, can oscillate in either direction.

Kingsbury Machine Tool Corp, Keene, NH—Booth 731

MORE DATA? Circle 352, inside back cover

JONES & LAMSON "AUTOMATION"

the man who needs a new machine tool is already paying for it

New numerically-controlled turret lathe shatters idle time . . . is ideal for short runs

At the last Machine Tool Exposition, five years ago, Jones & Lamson exhibited an automatic tape-controlled turret lathe. It created a sensation and attracted thousands of fascinated spectators. Many of them wanted to buy. But the machine wasn't for sale. Why? Because there were still "bugs" in it to be ironed out, and our reputation is too valuable to risk on an "almost" product.

In the five years since, J & L still kept this lathe off the market, pending its complete development and proving-out. Now, it is ready to be shown, ready to be sold, ready to help you attain new production efficiency.

The new J & L numerically-controlled turret lathe is a complete redesign job. The sound features of the early prototype have been retained, and all question marks have been eliminated. In every way, this is a real beauty!

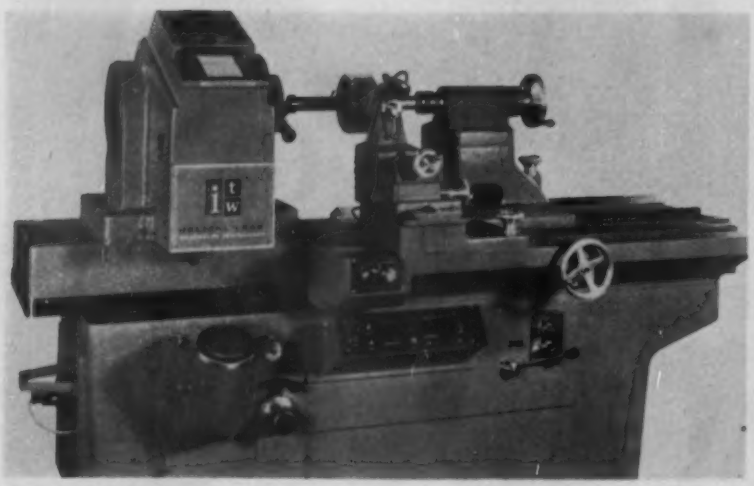
It's designed especially for short run production and top economy. It has the capacity of a No. 5 machine, 2½ x 24 in., and has three turrets (one hexagon and two square) which accept up to 14 preset tools. A set of tools plus the tape can be "packaged", ready for set-up when needed.

This lathe can be set up as either a bar machine or a chucker, in 10 to 15 min. It positions within .001″, repeats to .0005″. Drive motor is 30 HP, with spindle speeds of 40 to 2000 rpm in 24 steps. Feed rates for carriage and saddle are .750″ to 30.0″ per minute in 16 steps, plus fast motion. Cross-slide operates at one-half these rates. Tape input information may be adjusted for extended tool life and size control by manual dials on the control panel. Productivity is increased 25 to 30% over standard cycle time. Even the automatic bar feed is programmed from the tape. See it at Chicago, or write for advance information now. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

MMT-PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

Inspection



Helical Lead Gear Measuring Instrument Features Direct-Reading Optical Setter

The instrument has a 15-in. dia graduated disk which is mounted directly to the sine bar and which is accurate to ± 1 sec of arc. The reading is projected through a large screen.

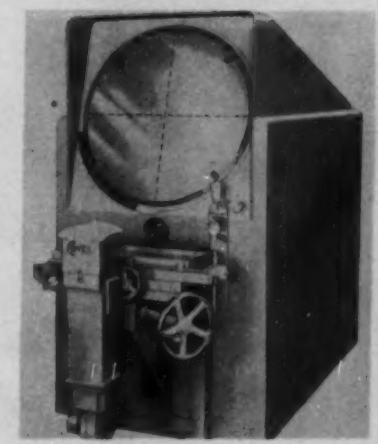
The sine bar is mounted solidly to the base, and is locked to the base when checking. Its setting drive is powered.

The headstock incorporates a horizontal cross slide, which moves on hardened and ground ball ways, banded to a large drum on the headstock spindle. An adjustable tailstock permits alignment in both horizontal and vertical planes.

Units are available in 12 or 24-in. dia gear capacity and are equipped with integral electrical recording or with separate portable recording as desired.

Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill—Booth 242

MORE DATA? Circle 353, inside back cover



Covel Optical Comparator Uses Micrometers of One Inch Travel

The stage of Model No. 30, which has an 8 x 24-in table, has micrometers of one inch travel for measuring both the horizontal and vertical planes with provision for measuring rods or gage blocks for the balance of the stage travel.

Because the optical system uses relay lenses, the projection lenses are inside the cabinet and therefore do not project out over the table. This gives maximum staging room. The optics are arranged for an upright image of all magnifications. Standard lenses available are 10, 20, 31¼, 50, and 62½ power.

The screen ring is graduated and has a 2-min vernier. Because this ring is rotated through a reduction gear setup by a small knob, very fine increments in angular adjustment can be obtained. Stage table has built-in angular adjustment 15° each way with vernier.

The turret is operated from the front of machine, and any one of the magnifications (listed above) can be easily selected from one of the five stations.

Covel Mfg Co, Benton Harbor, Mich—Booth 332

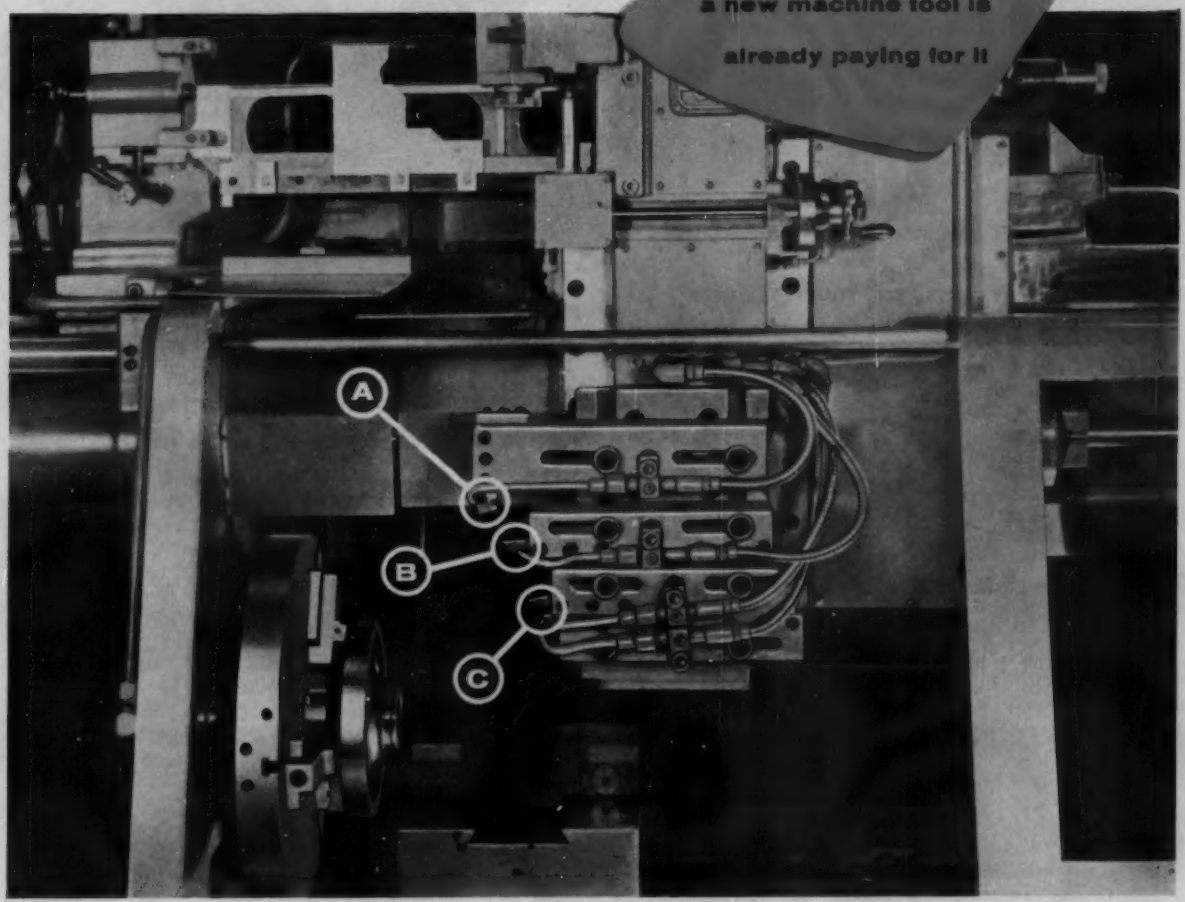
MORE DATA? Circle 354, inside back cover

EXHIBITORS SHOWING INSPECTION EQUIPMENT

BOOTH	EXHIBITOR
1120	American Gage & Machine Co Size Control & Walsh Press & Die Divisions Chicago, Ill
332	Covel Manufacturing Company Benton Harbor, Michigan
929	The Fellows Gear Shaper Company Springfield, Vermont
1042	Gisholt Machine Company Madison 10, Wisconsin
839	Jones & Lamson Machine Company Springfield, Vt
945	Michigan Tool Co Detroit 12, Mich
1430	National Broach & Machine Co Detroit 13, Mich
201	The Sheffield Corp Dayton 1, Ohio
1120	Size Control Div of American Gage & Machine Co Chicago, Ill

JONES & LAMSON
MACHINE COMPANY

the man who needs
a new machine tool is
already paying for it



Multiple Tool for a Fully Automatic Two-Dimensional Tracing Cycle

The two-dimensional tracing slide on the new Jones & Lamson Model 30 Automatic Tracing Lathe provides a new opportunity for multiple tooling on tracing operations. In addition, this slide offers eight different tracing cycles for tool motion — each of which controls tool travel through a full 180° of motion.

Automatic speed and feed changes during a cut allow for the proper cutting speeds on varying diameters, resulting in longer tool life, better cycle time, and desired surface finish. *For Example:* The illustration above shows the machine as it is tooled up for one of a variety of sizes of gear blanks. Three tools on the tracing slide machine the various surfaces of the blank in one completely automatic cycle. Tool "A" approaches the work first. It chamfers and turns the O.D. At the end of the turn, tool "C" is in position to chamfer and face the contour of the hub. As this is completed, tool "B" faces the piece, contours the large radius at the flange and faces the flat surface at the face of the gear blank O.D. Automatic speed and feed changes may occur as each tool is engaged.

Multiple tooling of tracing operations not only shortens tracing cycles, but also offers the opportunity for proper tool geometry for each particular phase of the operation. Set-up from one job to another is accomplished in a matter of minutes by graduated dog rings on the conveniently located control drum.

You can see this machine in operation at the NMTBA Exposition, Booth #839, in Chicago. Or you can get detailed information now by writing for Catalog No. LO-6011. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Variable Involute Profile Measurer Does Not Require Fixed Base Circles for Each Gear Size

Because it has a master base circle segment which is always larger than the work to be checked, the profile measurer reduces all slide motions; any errors or lost motions of the mechanism are minimized in proportion to the work being checked. This instrument maintains the desired concept of base circle checking without requiring fixed base circles for each gear size.

The base radius setting is made by means of a precision scale reflected through a large direct-reading optical screen. Sensing unit is mounted on a movable slide, with hardened and ground ball ways, and the sensing finger is tangent to the base circle in the operating position. The check is charted with an integral electrical recording system.

The instrument comes standard in 12 or 24-in. gear diameter capacity.

Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill—Booth 242

MORE DATA? Circle 355, inside back cover

Illinois Tool Automatic Final Gear Inspection Instrument Checks up to 600 Gears per Hour

A single unit, demonstrating the building block principle of the machine, will illustrate how the instrument can be assembled with as many multiple stations as required to check all elements of gears. Although checking may involve making direct pin diameter or pin radius readings if desired, the basic principle of the automatic inspector revolves around the use of master gears.

Because of the unique design of master gears (some patented) and their mountings, actual inspection can vary from the usual composite check to semi-analytical checks through the use of electronic circuitry to isolate various gear errors. Complex signals control a memory device which accepts or rejects gears to prescribed tolerances and also sorts accepted gears into size classifications for mating in assembly.

A memory device and its counters keep track of these records, control production equipment such as hobbing and shaving machines, and stop production as parts begin to fall out of tolerance. The machine on display will check PD runout, size, and nicks.

Parts can be fed automatically through the inspector by gravity-fed conveyors or by indexing mechanisms which positively control flow to prevent nicking in transfer.

Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill—Booth 242

MORE DATA? Circle 356, inside back cover

Portable Involute Profile Checking Lead Sets Up Easily

The new instrument, which was designed for testing production gears which are too large or heavy to check on existing measuring instruments, weighs only 20 lb. It can easily be carried to production machines for in-process checking.

Because the testing machine locates directly in the gear teeth with three ball feet, it eliminates cumbersome holding and locating mechanisms which previously complicated the setting-up operation.

In operation, a powered indicator follows the theoretical involute path through contact with a variable cam. The indicator finger measures any deviation of the gear tooth from the true involute curve.

The instrument, which is equipped with a pick-up head for electrical recording, is independent of diametral pitch and therefore will check any involute gear, either spur or helical, from 24 to 200-in. base diameter.

Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill—Booth 242

MORE DATA? Circle 357, inside back cover

JONES & LAMSON
OPTICAL COMPARATORS

the man who needs a new machine tool is already paying for it

J & L Optical Comparator is a production tool

At John Hassall, Inc., Westbury, L. I., nails, screws, rivets, fasteners, and other small parts are "Job-Designed" to satisfy the customer whose requirements cannot be adequately met by the standard item.

Rigid AN (military) specicfiations are strictly adhered to whenever required. In all cases, the Jones and Lamson Optical Comparator has become an almost indispensable production tool.

In the cold heading process used at Hassall, the J & L Comparator acts as a monitor for controlling the essentials of the production process. *Tools* for manufacture of dies are checked for proper cutting edge and angle. *The dies* themselves are checked for cavity contour and angle by taking plastic impressions. *Finished parts*, accurately magnified 10 times under the critical eye of the Comparator, are checked at a glance for tolerances. But, even more importantly, this inspection gives essential information as to when and where dies may be worn, or where other areas of the *manufacturing process* should be changed. How easy it is for production control and tolerance requirements to be maintained!

J & L Comparators, featuring magnifications up to 250X are ready to go to work for you. Write for literature. Jones & Lamson Machine Company, 502 Clinton St., Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Gear Rolling Fixture Indicates Errors on Large Dial Indicator

In Model GRH gear rolling fixture, the work gear is mounted on a shaft detail that can be positioned in a T-slot. The master gear is on a pivoted shaft mounting whose movement during rolling contact with the work gear is shown on a large dial indicator. Fixture illustrated measures 18x10 in., and has a center-distance capacity of 1⅞ to 12 5/16 in. A motor drive for the master gear is available as optional equipment.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich—Booth 1430

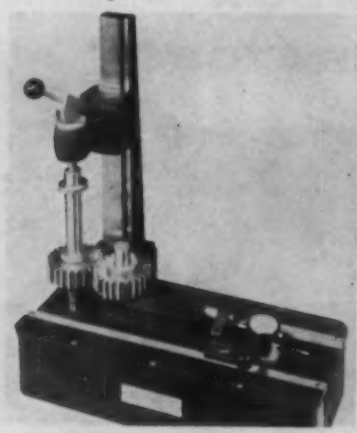
MORE DATA? Circle 358, inside back cover

Smith & Mills Shapers Now Have Electronic Duplicator

A Voss electronic duplicator, which controls vertical table travel while the table itself is feeding horizontally, is now available for the complete line of shapers. This optional equipment makes the machines highly adaptable for accurate contouring. The stylus follows the contour of the master templet, with the table automatically and electronically synchronized.

Smith & Mills Shaper Div, Nebel Machine Tool Corp, 3401 Central Parkway, Cincinnati 25, Ohio—Booth 1319

MORE DATA? Circle 363, inside back cover



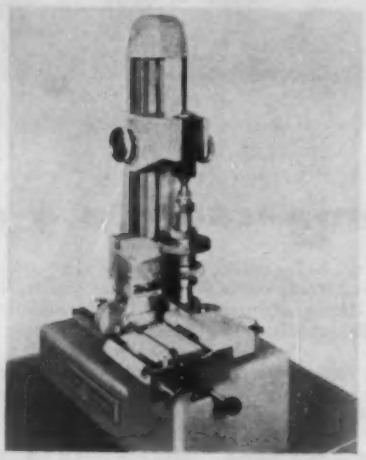
Gear Rolling Instrument Gives On-the-Spot Quality Control

The instrument, which has a black crackle finish, is designed for on-the-spot quality control at a gear-cutting machine. With this unit, which utilizes the same basic principles as the ITW laboratory-type gear rolling instrument, the production gear is rolled against a suitable master. Errors are reflected as center distance variations by means of a 0.0005 in. dial indicator.

The production gear is quickly and easily engaged with the master. The manufacturer says that the unit is priced low enough so that it can be used in production-type quality control applications.

Illinois Tool Works, 2501 N Keeler Ave, Chicago 39, Ill—Booth 242

MORE DATA? Circle 359, inside back cover



Universal Gear Rolling Fixture Checks Many Types of Gears

Model GRJ gear rolling fixture is a universal type that has a variety of details for supporting gears of many different styles. The vertical work gear support shown here is used for long shaft-type gears. It can be positioned along a T-slot to obtain proper mesh with the master gear. Movement of the pivoted master gear mounting during rolling contact is indicated on a paper charting unit. A dial indicator gives a visual check.

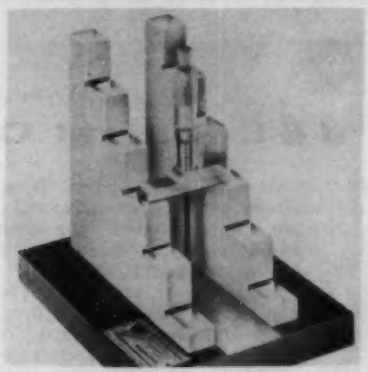
Fixture measures 28½ by 12½ in., and has a center-distance capacity of 1⅞ to 12 11/16 in. An optional accessory is a set of indicator lights with adjustable limits for visually indicating out-of-tolerance gears.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich—Booth 1430

MORE DATA? Circle 360, inside back cover

BALANCING MACHINE, type 1S, features belt-drive from beneath the work. It is equipped with separate unbalance location and mount meters, one set for each correction plane. Meters hold unbalance readings until correction is made—*Gisholt Machine Co, Madison, Wis*—Booth 1042

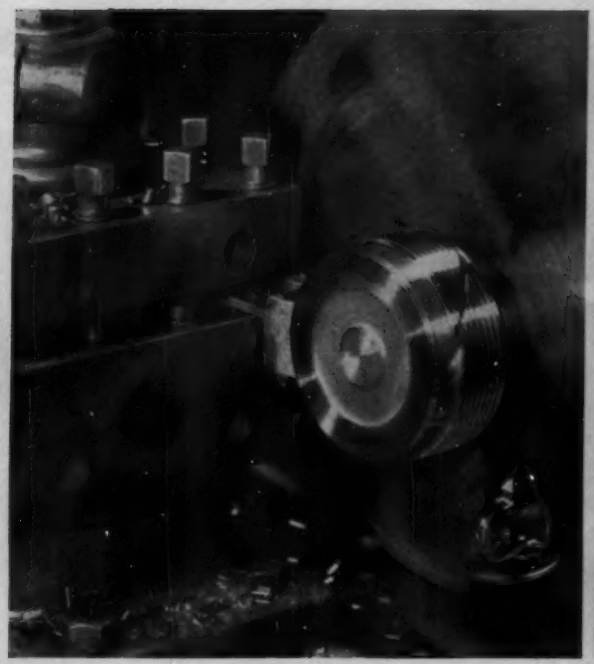
MORE DATA? Circle 361, inside back cover



DEPTH MIKEMASTER checks settings of depth micrometers. Range is 0.500-5.50 in. in six steps (AM/MM—Feb 22 '60, p146)—*Size Control Co, 2500 W Washington Blvd, Chicago, Ill*—Booth 1120

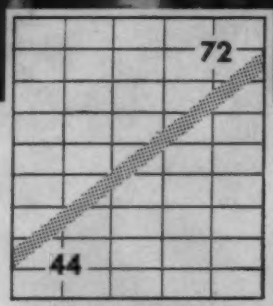
MORE DATA? Circle 362, inside back cover

V-R CUTS threads faster
CUTS costs 83%

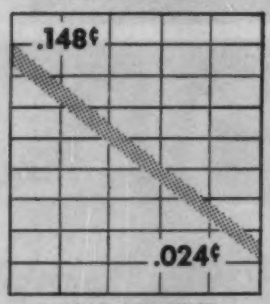


NEW IDEA at MISSION

MISSION MANUFACTURING CO., Houston, Texas, manufacturers of oil field and industrial equipment, now cuts threads using negative rake throw-away tooling with standard precision VR-73 inserts. Production has increased from 44 to 72 pieces per 8 hour shift. Threading tool costs have been cut 83% — from .148¢ to .024¢ per piece. Carbide grade VR-73 produces 3 times the pieces per cutting edge. The throw-away feature allows accurate indexing without tool changes and costly set-ups. These benefits are not obtainable with the previously used brazed tool. This new idea in tooling has also given Mission greater accuracy, improved finish and more consistent production. *Call your V-R man today. Write for fully illustrated catalog.*



PIECES PER SHIFT



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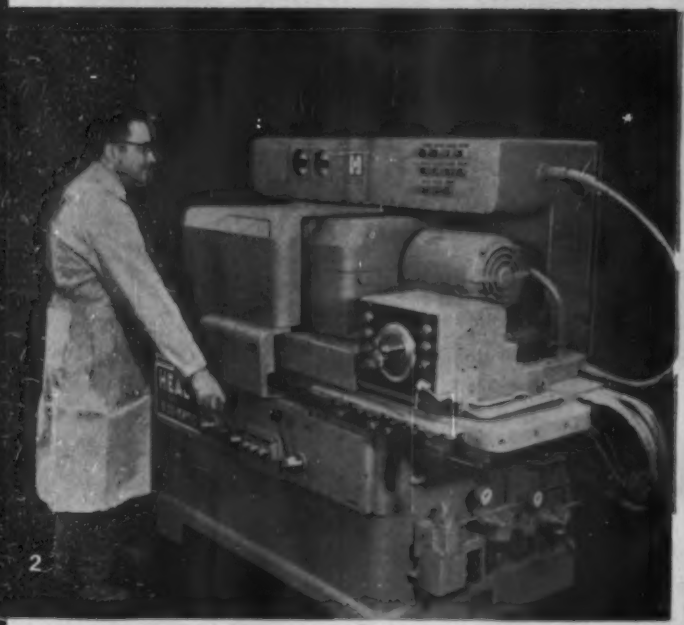
1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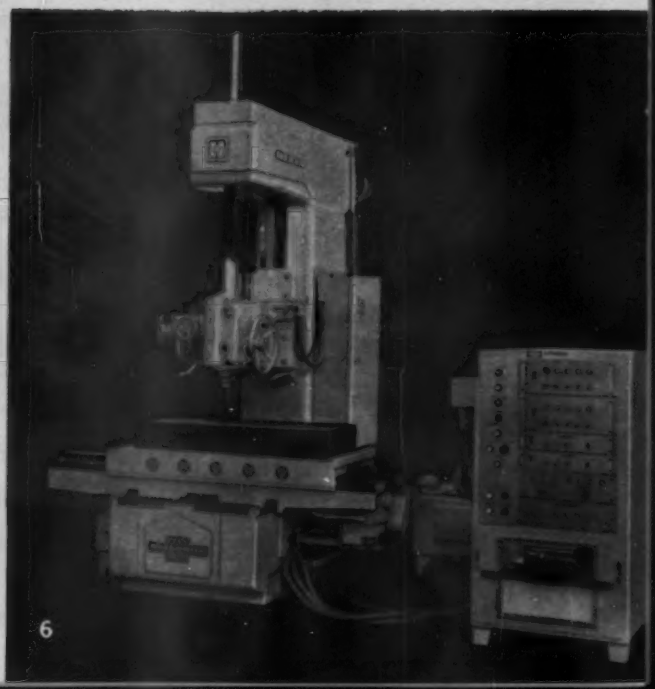
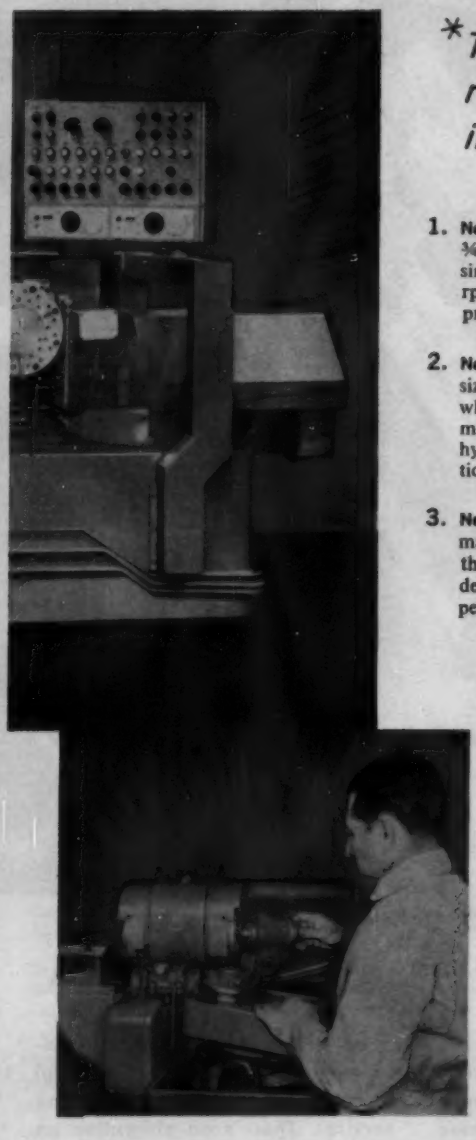

6

new* HEALD MACHINES

at the Machine Tool Exposition



These and other new Heald developments represent the latest cost-cutting advances in the art of removing metal

1. **New Model 090 Internal,** for miniature bearing races and other small circular parts up to ¾" O.D. and ¼" in length, provides fast, high-precision production with exceptional simplicity of operation. Choice of air or electric drive gives wheel speeds up to 150,000 rpm. Skip dressing reduces wheel wear. Wide way spacing gives added stability and heat-producing equipment is isolated from the machine base.

2. **New Model 171A Internal,** for work up to 8" O.D., offers greater accuracy, more constant size and faster production, with easier operation and maintenance. Cross-slide-mounted wheelhead has new feed box that provides either constant feed or impulse feed for maximum straightness on long bores. Compensation is infinitely variable from 0 to .004. All hydraulic units and core plates are located outside of the base, preventing thermal distortion and simplifying maintenance.

3. **New Model 322A Bore-Matic** offers a new high in accuracy, precision and simplicity of maintenance, with larger workhandling capacity than ever before. The base contains only the piston and cylinder. External hydraulic units, valves and piping eliminate accuracy-destroying heat and are easier to service. Infinitely variable boringhead bridge setback permits optimum relationship between work and tooling.

4. **New Tape-Controlled Bore-Matic,** designed exclusively for numerical-control, bores and turns free-form shapes with heretofore unattainable accuracy and precision, maintaining tolerances within ± .0001". Pressure-lubricated ways track to .000025 in 20" of travel. Cam-controlled spindle drive automatically maintains proper cutting speed at any point on the workpiece. Available with Cincinnati "Acramatic" control.

5. **New Model 4 Tool Sharpening Machine** meets the needs for either conventional or contour Borizing by grinding *both* elliptical-point and true-radius tools with highest precision and economy. Fully automatic tool reciprocation assures uniform and repetitive tool tip accuracy.

6. **New Numerically-Controlled HEALDRILL** takes full advantage of modern numerical control. Drill positioning, speeds, feeds, "Z" axis cycle and tool-change indication are all controlled automatically by punched tape. For further details, see inside front cover of this issue.

These and many more advanced-design Heald machines are shown in action in Booth 924. Don't miss it! If you don't get to the Machine Tool Exposition, be sure to ask your Heald engineer about these new machines—or write for additional information on the models in which you are interested.

It PAYS to come to Heald

MMT-PE

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • Milwaukee • New York • Philadelphia • Syracuse

HEALD

CIRCLE 848 READER SERVICE CARD

From the HEARTLAND of America

From Chicago—the Heartland of America—these leaders in their respective fields of production and precision can help you with your manufacturing problems.

CHAMPION'S

Two-Stage Automatic Horizontal Compressor OEH 38-60 with Exclusive Oil Monitor (low oil level safety control).

WALSH 38-Ton Air-Clutch High Production O.B.I. Press

All presses "run-in" with Molykote at the factory.

Let our experience in the fields of production and precision prove beneficial to you and your product. Write or phone any of these firms for complete information about their important new products and services. In addition, all offer free engineering consultation services. There's no obligation on your part, of course.

Be sure to visit our booth #1120 at NMTBA Show

Industrial Divisions of AMERICAN GAGE and MACHINE COMPANY

CHAMPION PNEUMATIC MACHINERY COMPANY • 826 North Pleasant Street • Princeton, Illinois • Phone: 3-1215—Air Compressors Since 1919

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  Chicago 12, Illinois MOnroe 6-6710
  Precision Gages
  Centerless Lapping Machines
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  Punch Presses Since 1907
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  Inspection Service for Industry

CIRCLE 849 READER SERVICE CARD

"Molded Horsepower" to fit your machine tool

...no longer must you "make something do!"

Just as a famous artist molds each illustration to his need... so, too, can you now have a machine tool motor designed for machine tool use. Not just another line of motors that can be "made to fit," but a complete new type developed, by Reuland, exclusively for machine tool manufacturers.

Reuland "Molded Horsepower" offers a combination of advantages never before available. Dynamic balancing, low inertia rotors, heavy duty ball bearings straddling the rotor, compact "wafer" design, smooth finished castings, baked enamel finishes... even pleasing lines that can be varied to fit the contour of *your* machine!

No wonder Reuland is "number one" supplier to many of the top names in the machine tool field!

Reuland Precision Machine Tool Motors are available in totally enclosed non-ventilated or fan cooled types – ratings from ½ h.p. through 15 h.p. Also available as a machine tool *brakemotor*, incorporating both motor and Reuland magnetic brake in a single frame.

Our new 8-page catalog, No. GS8-30-0, will come in handy. Sent complete with prices and engineering drawings on request.

Refer to Sweet's Product Design, Section 5-a

MODERN POWER FOR MODERN-DAY PRODUCTS

...all in lightweight, cool-running aluminum frames!

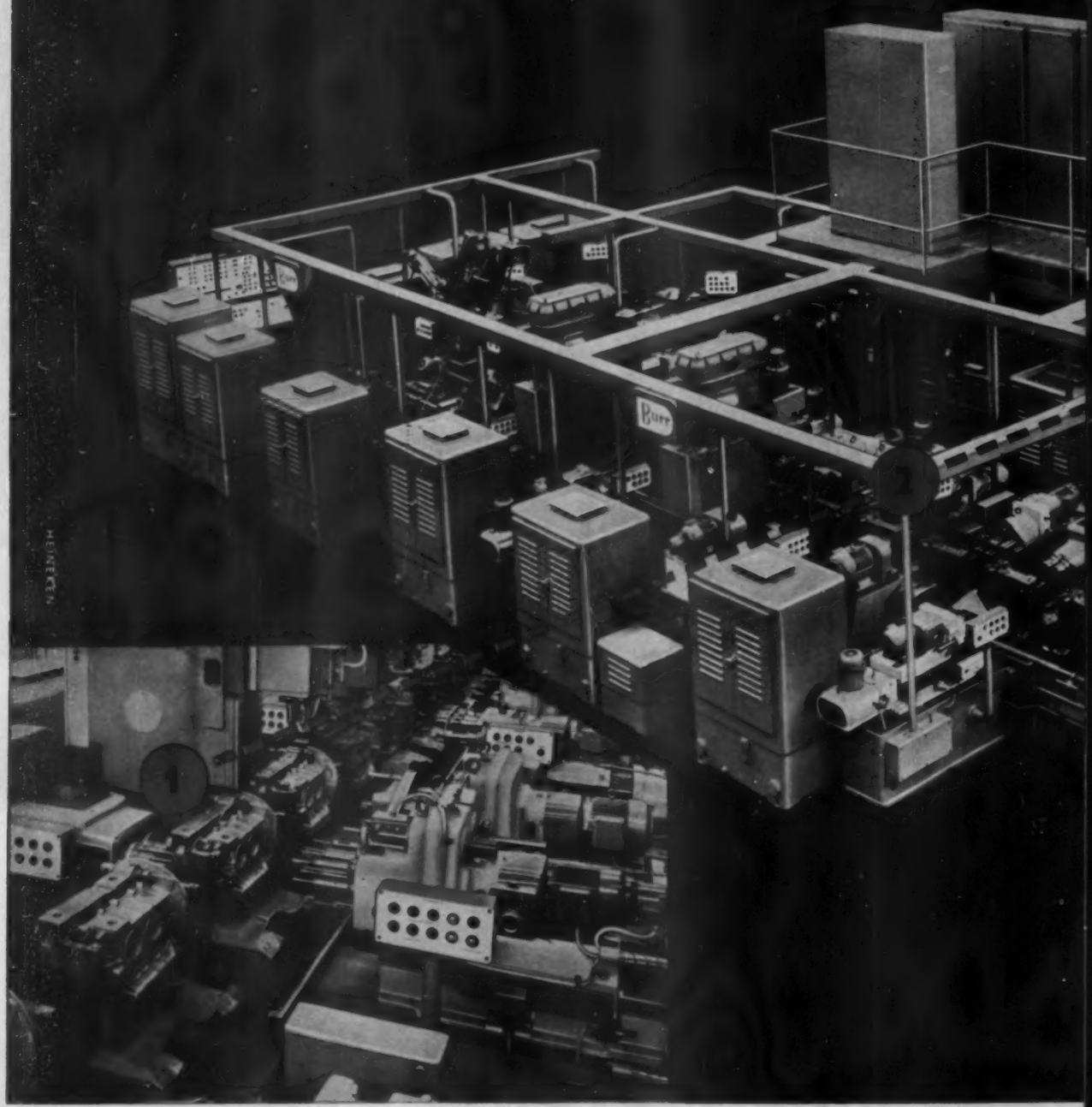
REULAND MOTORS

REULAND ELECTRIC COMPANY
WESTERN DIVISION: *Alhambra, Calif.*
EASTERN DIVISION: *Howell, Mich.*
Distributors in all principal cities

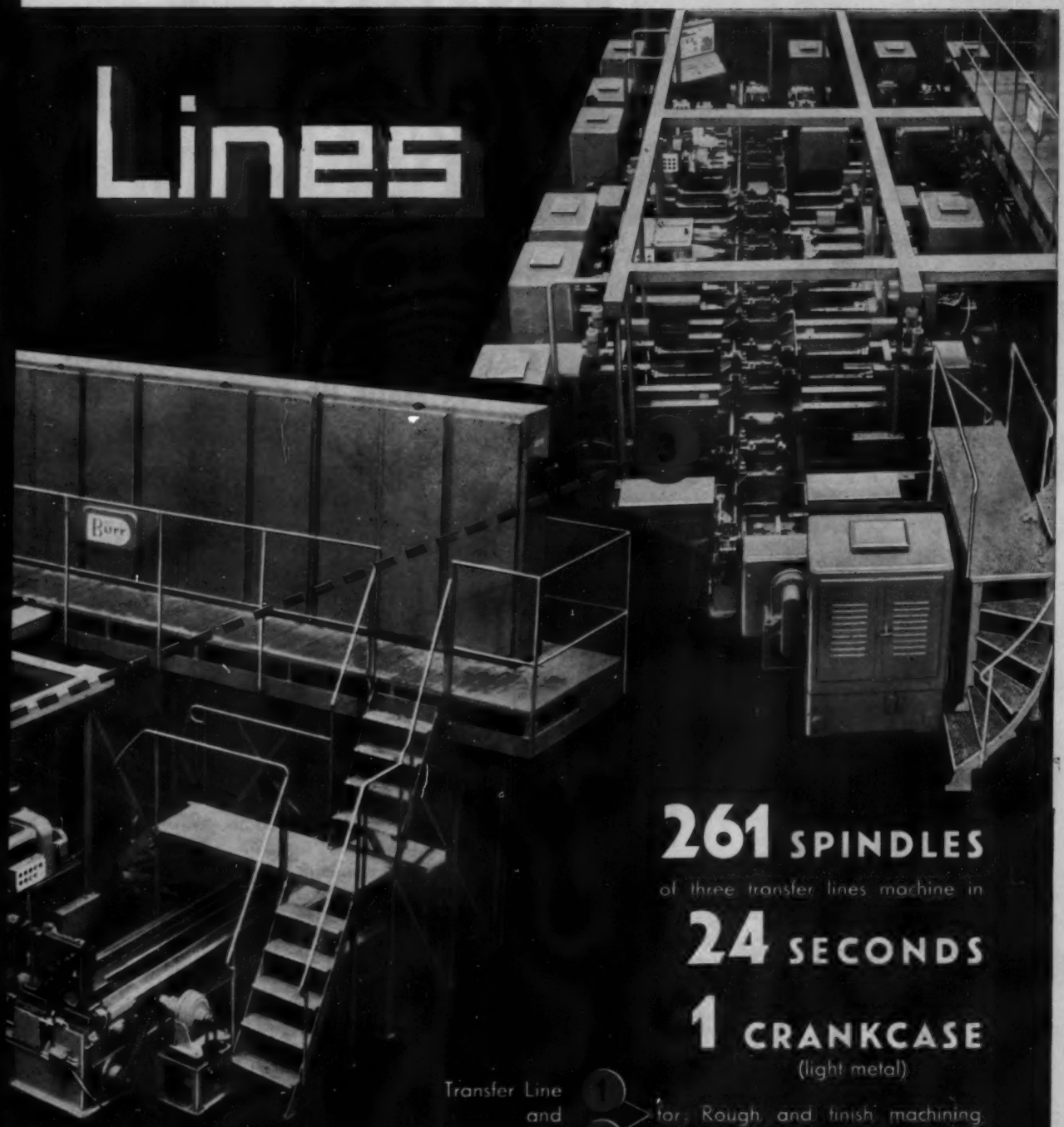
CIRCLE 850 READER SERVICE CARD 295

Burr

Transfer



Lines



261 SPINDLES

of three transfer lines machine in

24 SECONDS

1 CRANKCASE

(light metal)

Transfer Line 1 and Transfer Line 2 — for: Rough and finish machining two different crankcase halves

Transfer Line 3 — for: Complete finish machining of assembled crankcase

LUDWIGSBURGER MASCHINENBAU GMBH

LUDWIGSBURG / WUERTTEMBERG, GERMANY

U.S. DRILL HEAD MUTUAL ADMIRATION SOCIETY

IS MADE UP OF HEADHUNTERS

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Edlund Machinery Co.
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Giddings & Lewis/Bickford
Greenlee Bros. & Co.
Hause Machines, Inc.
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Kingsbury Machine Tool Corp.
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Leland-Gifford Co.
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ALL U.S. Drill Heads feature Positive All-Gear Drive . . . Shaved Hardened Gears on Involute Spline Shaft Mounting . . . Super Finish Spindles . . . and other advanced design and construction achievements which have kept U. S. Drill Head Co. Number 1 in the industry since 1915.

**WHY DON'T YOU JOIN THIS SOCIETY OF SATISFIED HEADHUNTERS?
ASK OUR ENGINEERS TO TALK WITH YOURS ABOUT U.S. DRILL HEADS!**

US DRILL HEAD

**Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.**

UNITED STATES DRILL HEAD CO.

Cincinnati, Ohio

SEE GISHOLT
PRODUCTION POINTERS

IN ACTION AT THE SHOW! Booth No. 1042

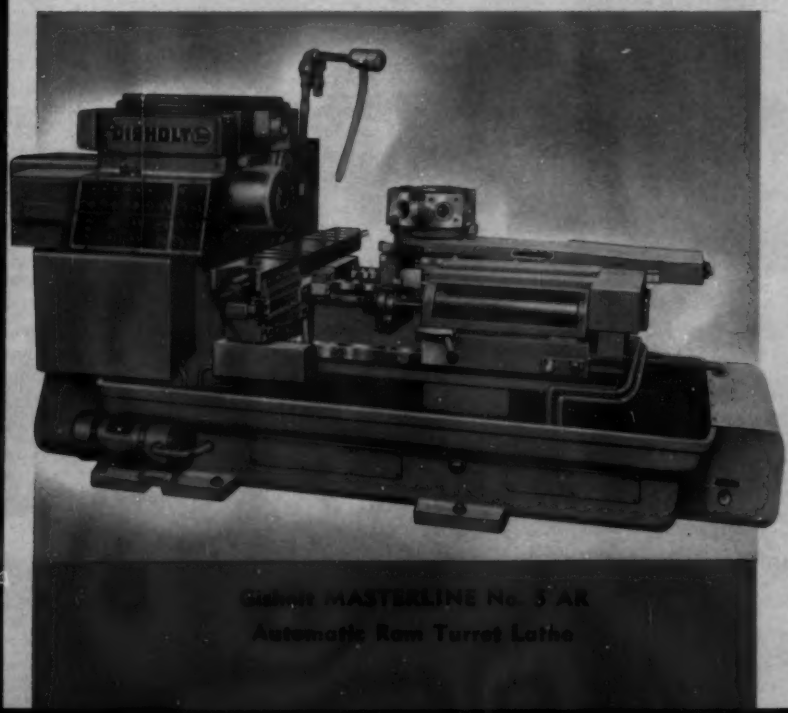
MMT-PE

Latest advances in:
Automatic Machining, Tape Control, Balancing, Superfinishing, Tracing

You'll take a big step ahead the moment you set foot in the Gisholt booth — at the Machine Tool Exposition.

The Gisholt booth will be alive with demonstrations showing new ways to cut costs, simplify your work and boost quality.

You'll see dramatic developments in such fields as magnetic and punched tape control—improved techniques in balancing, Superfinishing and automatic machining for job lots and production work. You'll see 15 machines in action—a few of which are shown here.



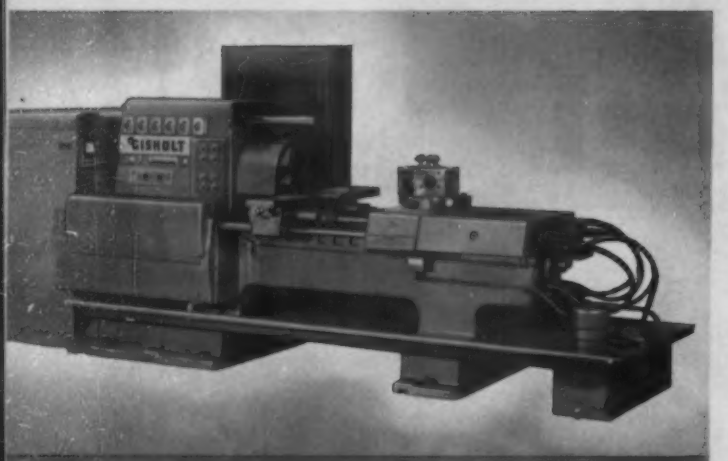
Gisholt MASTERLINE No. 5 AR
Automatic Ram Turret Lathe

First public showing of the Gisholt AR®

See the first Automatic Ram Turret Lathe — the Gisholt AR — handle both bar and chucking work with fast setup and automatic cycle machining — new savings in tooling, time — and increased operator productivity.

For information on AR Lathe, circle or write in No. 722 on inquiry card.

Latest advances from GISHOLT in action at the show — Booth No. 1042



Gisholt MASTERLINE® 3F Fastermatic Automatic Chucking Turret Lathe

New FeeDial® Control slashes setup time

Don't miss the Gisholt 3F Fastermatic Automatic Chucking Turret Lathe featuring new FeeDial Control. Now you can dial your feeds, flick your speed and function switches in just 15 minutes! Then set your tools and take your trial cuts.

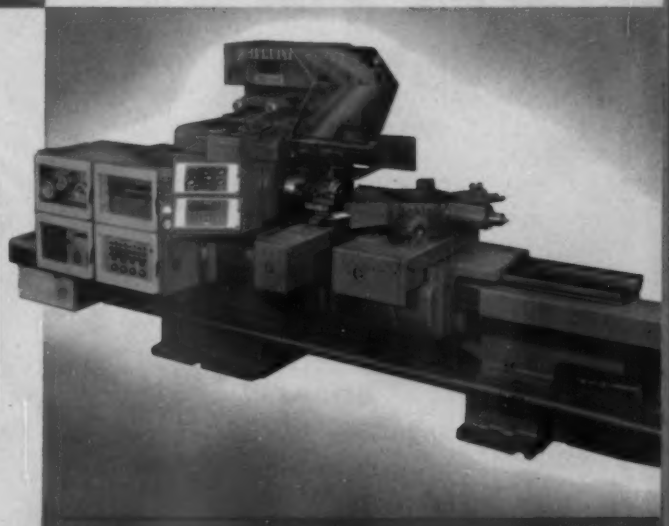
For information on 3F with FeeDial Control, circle or write in No. 723 on inquiry card.

New FACTROL® with continuous-path magnetic tape control

Push the button on the new Gisholt 101 FACTROL Magnetic Tape Controlled Turret Lathe and watch the standard single-point tools on the hex turret and cross slide machine intricate contour and step work on some really tough parts. See a FACTROL tape prepared on a simplified program computer.

Learn how your engineering department can use the FACTROL 101 to control production, cut your inventory and lead-time requirements — how it can handle your toughest parts with dramatic savings, both in time and in tooling.

For information on Factrol 101, circle or write in No. 724 on inquiry card.

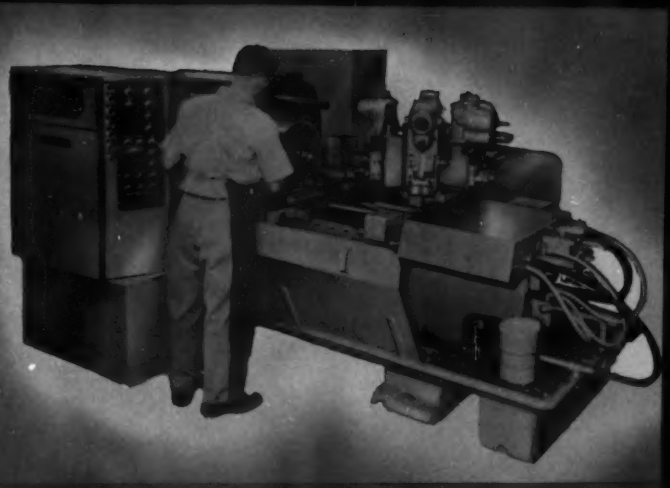


Gisholt MASTERLINE Factrol 101 Turret Lathe

Fastermatic® with point-to-point punched tape control

See a punched tape controlled Fastermatic Automatic Chucking Turret Lathe "think" its way through routine jobs. Again, production is controlled by your engineering department. This is IT for fast setup and automatic production on standard work without contours.

For information on Tape controlled Fastermatic, circle or write in No. 723A on inquiry card.



Gisholt MASTERLINE 1F Fastermatic Automatic Chucking Turret Lathe

Gisholt MASTERLINE 1S Balancing Machine

Balancer boosts production efficiency

Be sure to see the Gisholt 1S Balancing Machine — a machine equipped with "holding" meters. One set of meters for each correction plane indicates exact angle and amount of unbalance, and then "holds" the readings until the part is corrected — reducing chance of operator error and boosting production efficiency.

And watch exacting tests performed on the large Gisholt 4U Balancer. Note that both the 1S and the 4U Balancers require no special mountings — are unaffected by vibration from surrounding equipment.

For information on Balancing Machines, circle or write in No. 725 on inquiry card.

New Superfinisher® with automatic size control

Get the facts on the new Gisholt MASTERLINE 51B Superfinisher — a machine offering new economy on single- or multiple-diameter work. Note how the optional automatic size control offers consistent quality on close-tolerance work.

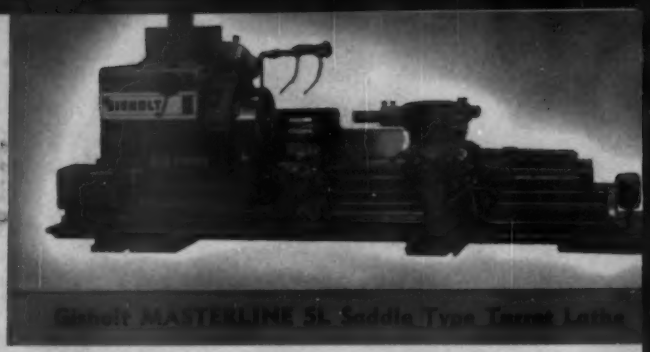
See the single-spindle, high-production Model 81 Superfinisher for flat, conical or spherical surfaces. Vertical design is ideal for use with in-out conveyor systems . . . requires minimum floor space and may be easily added to high-production lines.

Don't miss the Superfinishing attachments designed to fit on the front carriage of engine or turret lathes. These can also be applied to boring mills, grinders and automatic lathes.

For information on Superfinishing Machines, circle or write in No. 726 on inquiry card.

Gisholt MASTERLINE 51B Superfinishing Machine

See Gisholt Production Pointers in action at the show, Booth No. 1042



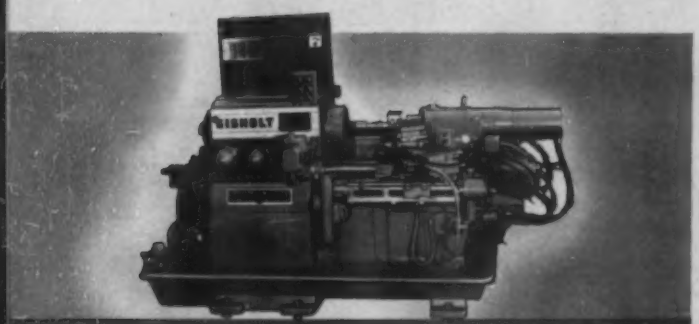
Gisholt MASTERLINE 5L Saddle Type Turret Lathe

Rugged 5L makes big jobs simple

See how efficiently the Gisholt MASTERLINE 5L Saddle Type Turret Lathe whips the heavy stock removal problems on massive steel chuck body forgings. Note the rigidity that permits use of ceramic tools on finish facing and turning cuts.

And find out how a Gisholt MASTERLINE 2L Saddle Type Turret Lathe with a turret-mounted JETracer slide tool gives you many of the advantages of automatic operation on a hand-operated machine — eliminates human error, saves on setup time and tooling costs.

For information on 5L Saddle Type Lathes, circle or write in No. 727 on inquiry card.



Gisholt MASTERLINE No. 12 Automatic Production Lathe

JETracer® on single-spindle automatic simplifies multiple-diameter work

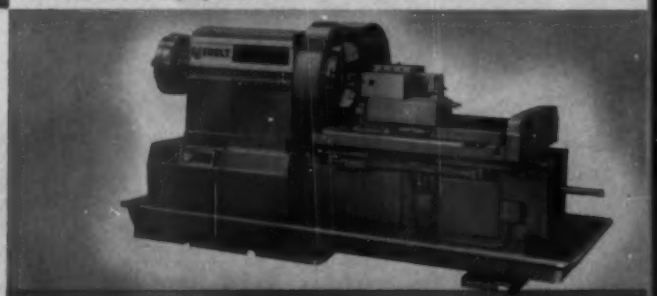
Watch while a No. 12 Automatic Production Lathe, equipped with a 4-pass JETracer on the front carriage, makes short work of multiple-diameter machining — contours, steps and radii. A ceramic tool on the final pass holds close tolerances and provides fine finish.

For information on No. 12 Automatic, circle or write in No. 728 on inquiry card.

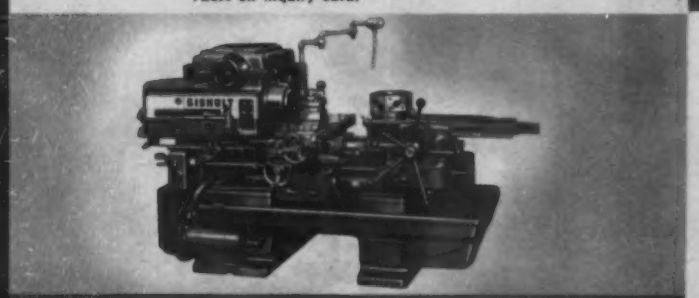
Simplimatic® cuts costs, boosts accuracy on bevel gear work

Discover the advantages of the Simplimatic's big, flat platen table on bevel gear work — how it permits rigid, compact tooling right up to the work for accuracy, maximum metal removal and long tool life.

For information on Simplimatic, circle or write in No. 728A on inquiry card.



Gisholt MASTERLINE Simplimatic Automatic Lathe



Gisholt MASTERLINE No. 4 Ram Type Turret Lathe

JETracer on bridge-type cross slide adds flexibility

And see how the Gisholt JETracer brings new cost and time savings to contour work on a standard Gisholt MASTERLINE No. 4 Ram Type Turret Lathe.

For information on Ram Type Turret Lathes, circle or write in No. 722A on inquiry card.

GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Turret Lathes • Automatic Lathes • Balancers • Superfinishers

Threading Lathes • Packaging Machines • Masterglas Molded Plastic Products

No. 7-860
764

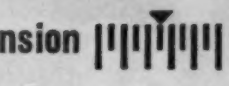
Printed in U.S.A.

If what you make is round or square or odd shaped

If you make it one at a time or by the millions

If you want to check its OD or its ID or a whole

lot of dimensions at once ...and if you want

the gage to indicate a dimension  or flash a light

or ring a bell or a machine on the basis of tolerances

down to thousandths .001 or millionths .000001

SHEFFIELD can recommend the exact type of

Air, Electric, Electronic, Visual or Limit gages you need...

or a complete automatic gaging or assembly machine or system...

with dimensional quality control based on the

ultimate standard of gagemaking: **INTEGRITY**

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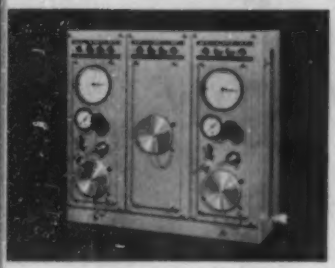
Gages, Measuring Instruments, Automatic Gaging & Assembly Systems • Machine Tools • Contract Mfg.

How many of these products



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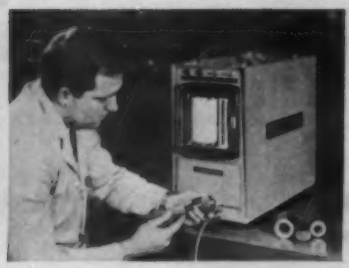

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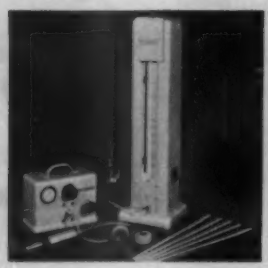

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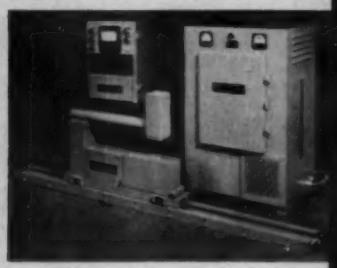

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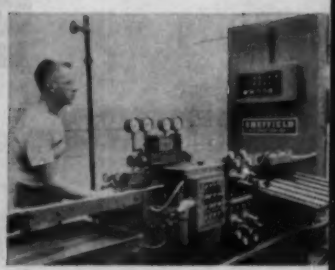

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18

1. Pneumatic gage control unit
2. Pneumatic Recorder
3. Precisionaire® gages
4. Measuray® thickness gage
5. Crankshaft gage
6. Multiform grinder
7. Machine control unit
8. Thread rolling machine
9. Double end precision threading machine
10. Automatic piston pin gage
11. Plunjet airsnap
12. Thread and form grinder
13. Automatic bearing assembly machine
14. Airetest® indicator
15. Press-Pacer® transfer machine
16. Monitorecord® machine operations analyzer
17. Master setting rings, xxx and xxxx
18. Gear chamfering machine
19. Micro-Form grinder
20. Plunjet® gaging cartridges
21. Cavitron® ultrasonic metal working machine

can you identify?

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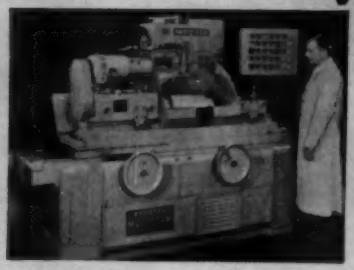
Machine Tool Show near the main entrance

5



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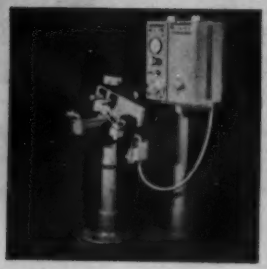

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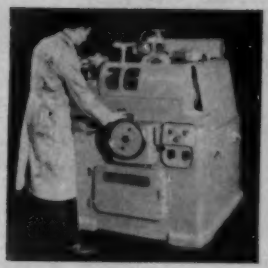

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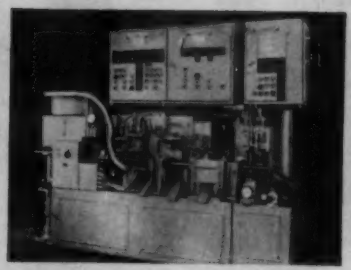

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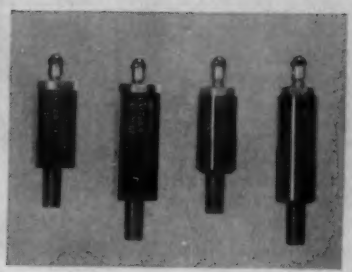

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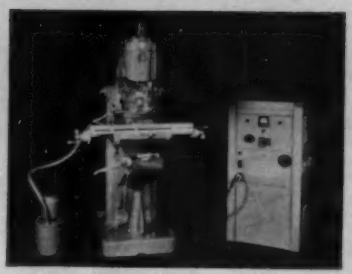

21

Here are just a few of the many precision products Sheffield makes. You'll do well to identify as many as six of those shown. May we send you a copy of Catalog No. GC957 showing more of Sheffield's complete product line?

Or for specific information, just circle the number, clip the ad and mail. We'll send the appropriate catalogs.

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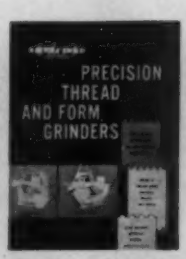
write for latest Sheffield literature

Air Gaging
Precisionaire® Gaging Handbook, describes full Precisionaire instrument line; standard & special air gaging equipment. 48-pp. Catalog SPG-160.

Ultrasonic Machining
Sheffield-Cavitron Machine Tools; specifications, applications, tooling; illustrates principles and job applications. 16-pp. Catalog CAV-759.



Thread and Form Grinding
Covers Sheffield Models 101 and 103 for tool room and production. Shows variety of Crushtrue® applications, attachments. 12-pp. Catalog TFG11-59.

X-Ray Thickness Gages
Describes broad applications of Measuray® non-contact X-ray gages for metals, plastics, paper, etc.—materials in motion. 16-pp. Catalog MY-1-60.

Gage Laboratory Instruments
Guide to planning a gage laboratory, plus facts on all Sheffield electronic instruments, visual gages, etc. for the complete lab. 20-pp. Catalog IN-1-57.

Automatic Gaging and Assembly
Review of Sheffield's building-block concept of automatic gaging and assembly machines — basic components, examples. 12-pp. Catalog AU-57-12.

Limit-type Gages
Easy to use complete catalog on A. G. D. and special plugs, rings, snaps, thread checking—wealth of valuable information. 40-pp. Catalog LTG-59.

Visual Gages
Presents basic features of Sheffield "shop proof" design, shows versatility of use, range of amplifications and accessories. 20-pp. Catalog 501-52.

Eli Whitney Metrology Lab.
Master measuring machines, instruments, other equipment; special construction of laboratory and calibration services. 20-pp. Catalog ML-1-56B.

Multiform Grinder
Presents features & specifications of Sheffield Model 181 Grinder with Crushtrue® wheel dresser. Shows examples of jobs. 10-pp. Catalog FG-181-260.

Sheffield Crushtrue® Process
How Sheffield Crushtrue® devices make it possible to produce threads and forms more accurately, at a higher production rate. 12-pp. Catalog CR-355.

Condensed Product and Service
85 illustrations: Covers Sheffield's gages, grinders, assembly machines, x-ray gages, ultrasonic machine tools and lab. services. 20-pp. Catalog GC-9-57.

Drop us a card or note with the numbers of the catalogs you want, or clip and mail this ad with the items checked.

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AUTO MAKER WANTED FASTER PRODUCTION

...and got it from DANLY®

See the Danly Display at the Machine Tool Exposition, Booth No. 1250

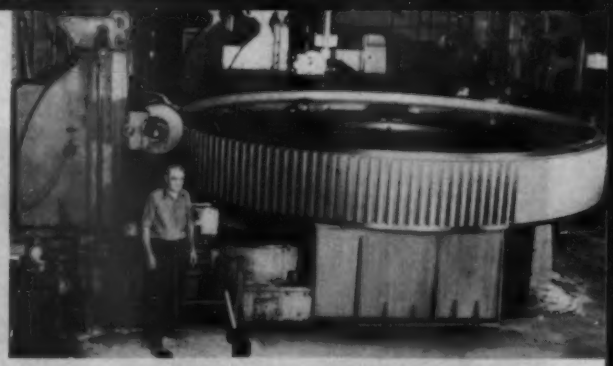
Deep draw body parts were the bottleneck when presses for the job couldn't deliver more than 7 fender draws per minute. So Danly supplied a double-action press equipped with a DANLY 2-SPEED CLUTCH that automatically speeds up approach and return of the slides, but keeps draw speed safe and slow. The rate was raised to 10 draws per minute without speeding up the critical drawing action. Output jumped from 420 to 600 parts per hour... a healthy 43% improvement.

And, typical of Danly equipment, both press and clutch have performed without a single interruption in output for maintenance. Another example of Danly ability to solve metal stamping problems with dependable, versatile equipment... this time with a low-inertia, 2-SPEED CLUTCH that makes a top-notch press even better!

Danly manufactures a complete line of mechanical presses, in capacities from 25 tons to 4,000 tons ... and up. Send for your copy of the Condensed Catalog of Danly Presses and ask for detailed information on The DANLY 2-SPEED CLUTCH... NOW.

DANLY

DANLY MACHINE SPECIALTIES, INC., 2100 S. LARAMIE AVE., CHICAGO 50, ILLINOIS



Big gear hobbing jobs like this one are everyday jobs for Chicago Gear. STANICUT Oil 208 BCS is the cutting oil used in all gear manufacturing machines.

Chicago Gear Mfg. Company tames tough steels, cuts costs with STANICUT Oil 208 BCS

Tames tough steels. Gears from one to 300 inches in diameter are machined by Chicago Gear. Steels up to 375 Brinell hardness are worked. STANICUT Oil 208 BCS helps them do it. STANICUT 208 contains maximum amounts of sulfur, chlorine and compounding to make it suitable for handling tough alloy steels. It is viscous enough to stay on big tools and work pieces, yet fluid enough to flow over the work in sufficient volume to assure good cooling.

Cuts costs. STANICUT Oil 208 BCS is used at Chicago Gear for all gear hobbing operations and for all other applications requiring a straight cutting fluid. There's no chance of the wrong fluid being used, thus no costly losses. One fluid cuts down inventory, saves time in keeping track of stocks, cuts paper work handling and ordering.

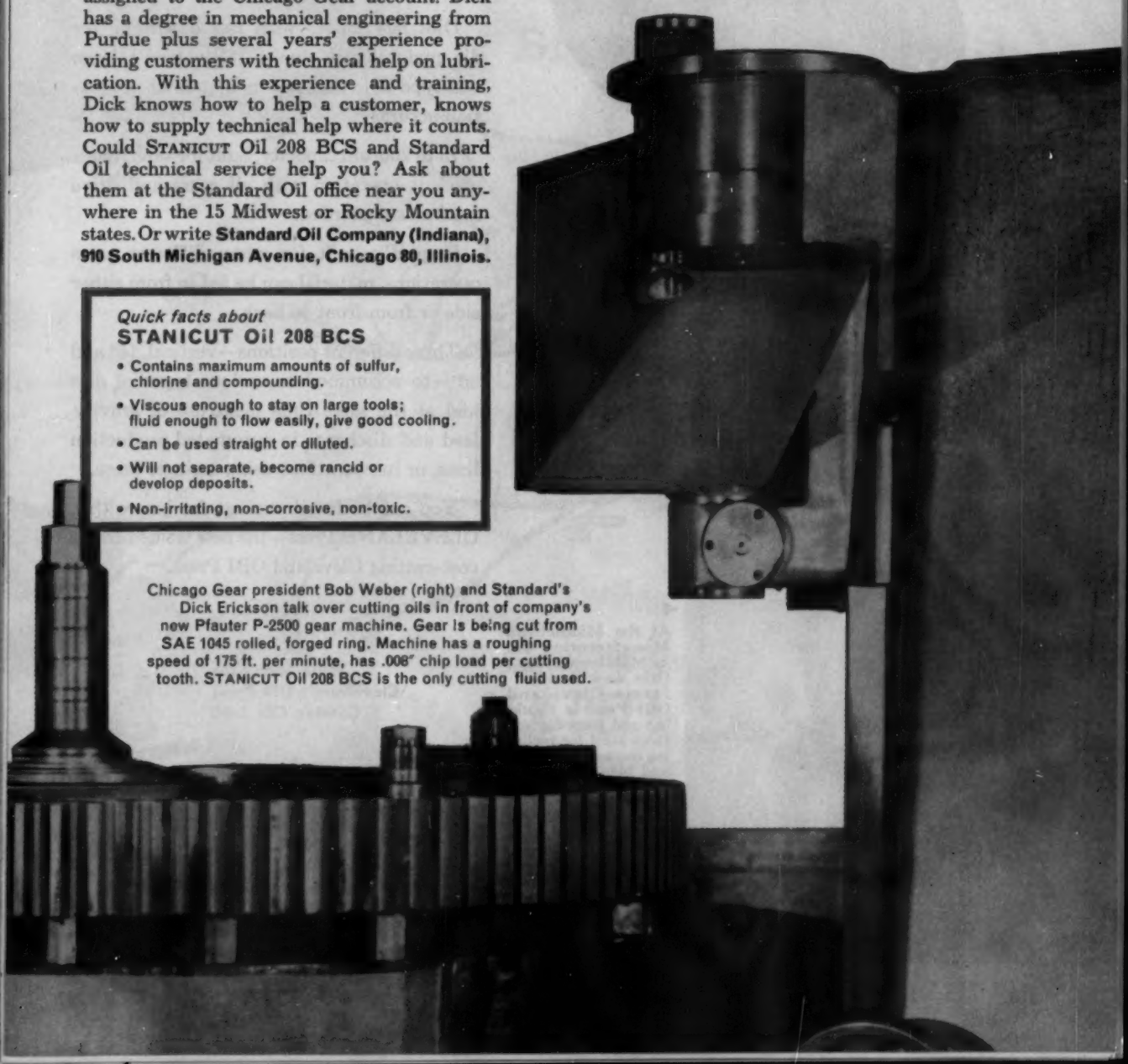
Gets service. Standard Oil's Dick Erickson is assigned to the Chicago Gear account. Dick has a degree in mechanical engineering from Purdue plus several years' experience providing customers with technical help on lubrication. With this experience and training, Dick knows how to help a customer, knows how to supply technical help where it counts. Could STANICUT Oil 208 BCS and Standard Oil technical service help you? Ask about them at the Standard Oil office near you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about
STANICUT Oil 208 BCS

- Contains maximum amounts of sulfur, chlorine and compounding.
- Viscous enough to stay on large tools; fluid enough to flow easily, give good cooling.
- Can be used straight or diluted.
- Will not separate, become rancid or develop deposits.
- Non-irritating, non-corrosive, non-toxic.

STANDARD

You expect more from Standard
and you get it!

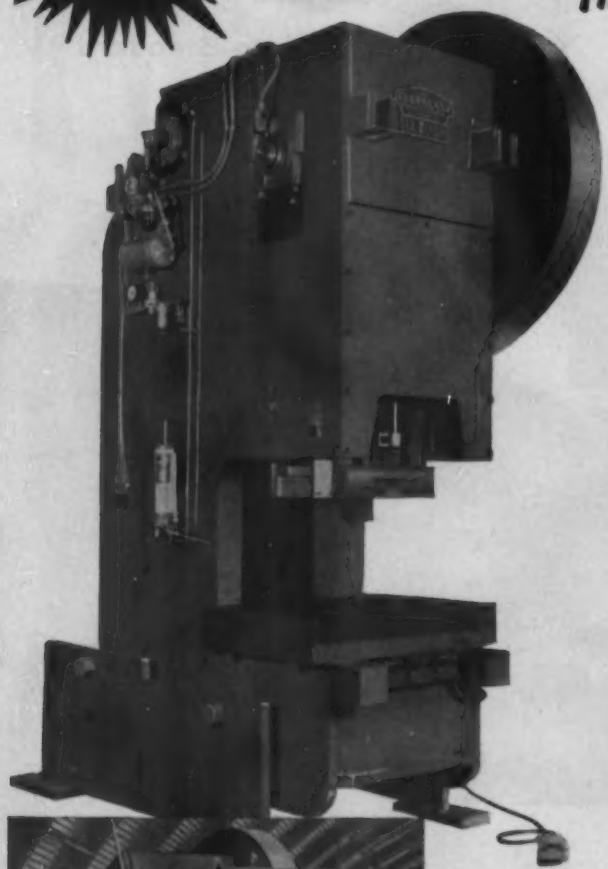


Chicago Gear president Bob Weber (right) and Standard's Dick Erickson talk over cutting oils in front of company's new Pfauter P-2500 gear machine. Gear is being cut from SAE 1045 rolled, forged ring. Machine has a roughing speed of 175 ft. per minute, has .008" chip load per cutting tooth. STANICUT Oil 208 BCS is the only cutting fluid used.

...DOES TOUGH JOBS *Dependably, Profitably*

CLEVELAND

NEW WELDED-FRAME COST-CUTTING *Open Back Inclinable* **PRESSES**



At the Middletown Manufacturing Co. in Middletown, Ky., this new welded-frame Cleveland OBI Press is blanking and piercing 3/16"-thick steel for reclining chair fixture parts and blanks for compressor cases. This Model 13-I has 150-ton capacity, 6" stroke of slide, 4" slide adjustment, 30 x 45" bed area and operates at 35 strokes per minute.

● Stronger structural frame—streamlined and built to withstand the shock and vibration of heavy-duty stamping.

Dies last longer with less downtime for die maintenance due to Cleveland's large box-type slide that results in greater production accuracy.

75 to 200-ton capacity, built for safer, more efficient operation with all gears and drive mechanism guarded.

Ruggedly built for many different press operations, material can be fed in from either side or from front to back.

Three different positions—vertical, 15° and 30°—to accommodate various types of dies and at the same time make use of gravity feed and discharge in automated production lines, or in operations using a single press.

You get better stampings for less with a CLEVELAND Press—the new welded-frame cost-cutting Cleveland OBI Press.

Write Today for Cleveland's OBI Press Catalog OBI 3-60

THE CLEVELAND PUNCH & SHEAR WORKS CO
Established 1880

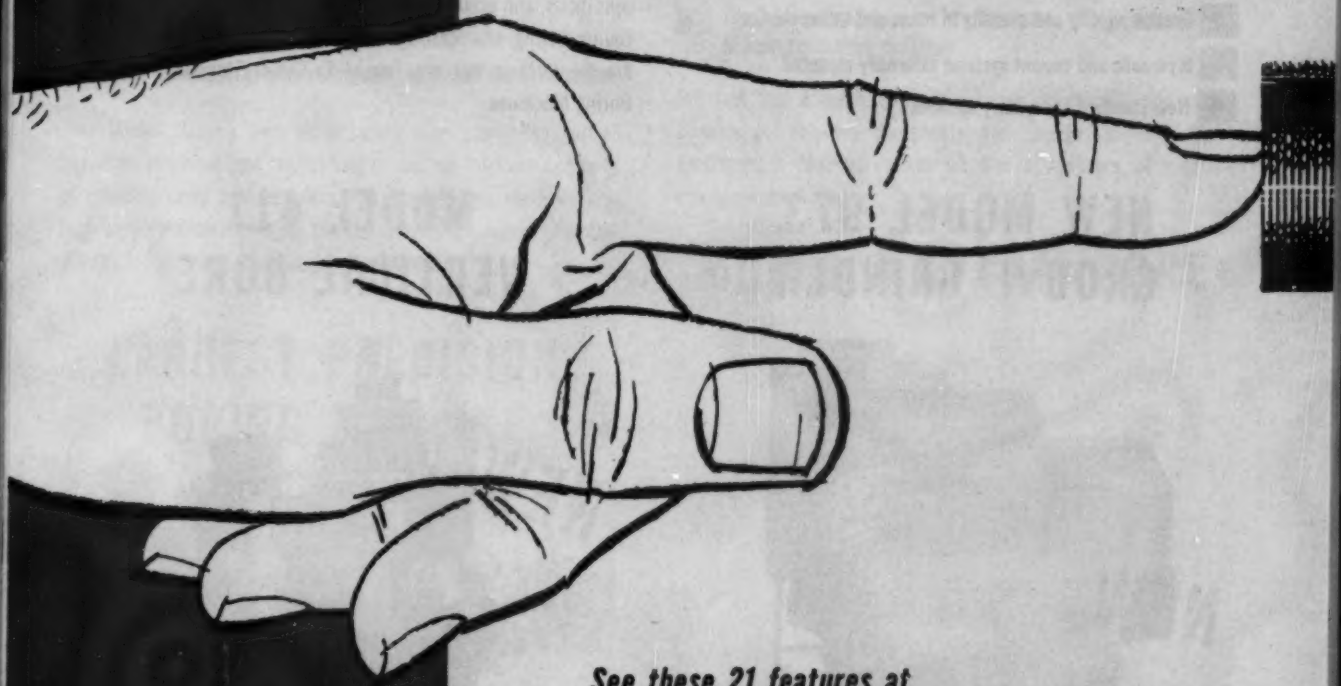
Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

ANNOUNCING

21

NEW EX-CELL-O PRODUCTION EFFICIENCY BREAKTHROUGHS



See these 21 features at

EX-CELL-O's BOOTH 946

Machine Tool Exposition, Chicago, Sept. 6-16.

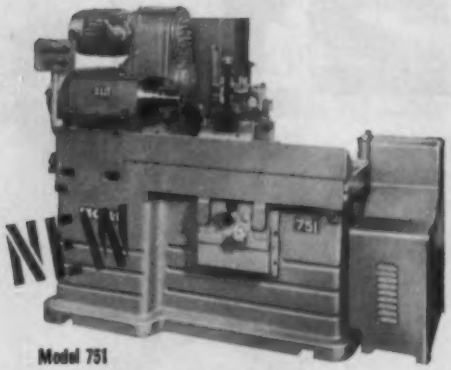
MODERN MACHINE TOOLS MMT PE PRODUCTION EFFICIENCY

NOTE: Immediately following these 4 Ex-Cell-O pages you'll find ads for Bryant Chucking Grinder Co., Michigan Tool Co. and Optical Gaging Products, Inc.—subsidiaries of Ex-Cell-O.

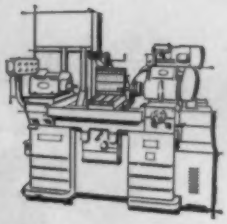
CIRCLE 862 READER SERVICE CARD

ANNOUNCING 21 NEW EX-CELL-O

NEW LINE OF PRECISION BORING MACHINES

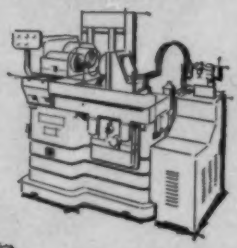


Model 751

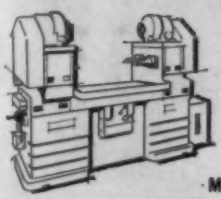


Model 732

NEW



Model 731



Model 752

- Temperature controlled hydraulic panels
- Greater rigidity and stability in bases and tables
- Hydraulic and coolant systems externally mounted
- New standard heavy duty spindles

Maximum dimensional stability under all kinds of operating conditions, and accurate repeatability on boring, turning, facing, counterboring, chamfering, recessing and trepanning operations are the forte of this new line of Ex-Cell-O Standard Precision Boring Machines.

NEW MODEL 973 GROOVE GRINDER

- Positive cam control of variable wheel feed and sparkout
- Hydraulically operated cross slide movements

Maximum speed and precision in the grinding of single, or multiple, grooves or forms mark this new machine's potential for breaking production efficiency barriers.

MODEL 411 VERTICAL BORE

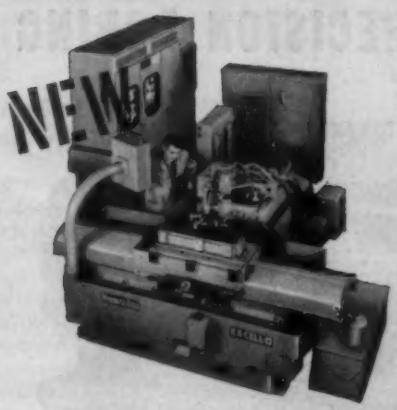
- Single column construction
- Seven different arrangements available

Versatility is the production efficiency feature of the new Model 411 Ex-Cell-O Vertical Precision Boring Machine. Easy tool changing and safe, easy, loading of heavy parts also contribute to this precision machine's effectiveness.

60—658

PRODUCTION EFFICIENCY BREAKTHROUGHS

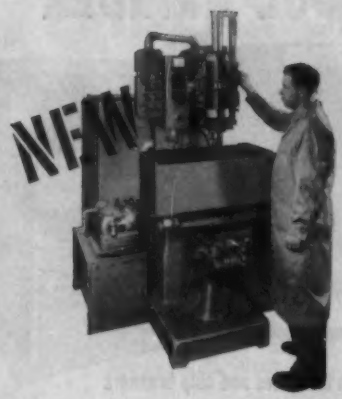
MODEL 922 NUMERA-TROL



- Slides controllable to 25 millionths of an inch
- Lead time, tooling, engineering and production costs minimized

The Model 922, a two dimensional tape controlled, ultra-precision machine tool for turning or boring intricate contours or grinding cams and templets. Designed to operate from any high performance numerical control system, it's a most effective means for reducing metalworking overhead.

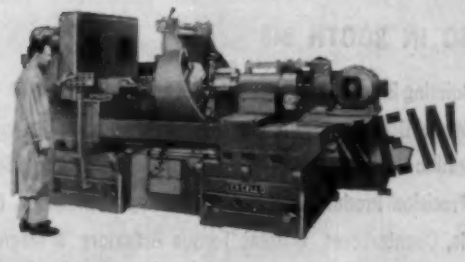
MODEL 244 VERTICAL ELECTROSPARK MACHINE



- Electrodes of various materials are used to form intricate shapes in hard conductive materials

For fast and accurate drilling, piercing, trepanning and cavity sinking in carbides, die steels, etc. The Ex-Cell-O Vertical Electrospark Machine offers all the advantages of electro-discharge machining.

LARGEST PRECISION BORING MACHINE



- Massive, heavy construction
- Hydraulics—infinite feeds, thrust-load compensation

Accuracy, heavy cuts and good finishes on large parts are the high-production characteristics of the Ex-Cell-O Model 772 Horizontal Precision Boring Machine. This largest horizontal boring machine in the Ex-Cell-O line is designed for maximum machine cycle efficiency.

60—65C

MODEL 308 CAM BORE

- Positive, direct cam control, no levers, on table and cross slide
- Fast, easy, cam changing for maximum versatility

On production parts requiring close-tolerance contouring, boring, turning, facing and grooving—singly or in various combinations—the Ex-Cell-O Models 308 and 312 Cam Boring Machines feature reliable repeatability for high production and quality.

MORE EX-CELL-O ANNOUNCEMENTS

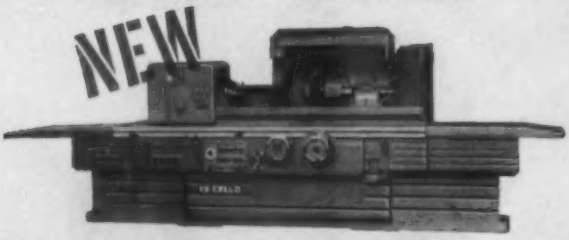
ANNOUNCING 21 NEW EX-CELL-O PRODUCTION EFFICIENCY BREAKTHROUGHS

MODEL 264 ELECTROLYTIC TOOL GRINDER

- Cuts diamond wheel costs
- Grinds both tool faces and chip breakers

Face grinding on one end and chip breaker grinding on the other —this Reciprocating Tool Grinder grinds high speed steel and carbide tools to blue print specifications quickly, at low diamond wheel cost, and without risk of heat checking.

MODEL 36 THREAD GRINDER



- Automatic wheel dressing, size compensation, wheel feed, retract, extra long leads, backlash compensation, and work speed control
- For production or tool room use

The hydraulically operated and electrically controlled Model 36 Thread Grinder produces accurately ground threads, internal or external, with minimum waste of time, labor or material. Single or multiple rib wheels may be used.

MULTIPLE SPINDLE PRECISION BORING

- Interchangeable multiple-spindle plates
- Fully automatic cycle for multiple hole precision boring

Full utilization on many jobs is afforded through the easily-changed multiple-spindle plates featured on Ex-Cell-O's Models 711 and 712 Precision Boring Machines. Built-in cross slide permits indexing between bores or sets of bores.

ALSO IN BOOTH 946

■ Building Block Set-ups ■ Center Lapping Machine ■ Grinding Wheel Dressers ■ Grinding and Boring Spindles ■ Quill-type Hydraulic Power Units ■ Drill Jig Bushings ■ Micron Sections ■ Precision Production Parts ■ Continental Broaches, Cutting Tools, Counterbores ■ Rotac Torque Actuators ■ Magna-Sine Magnetic and Non-Magnetic Sine Plates ■ Bryant Gages and Surface Plates ■ Cadillac Gages ■ Contour Projectors and Accessories

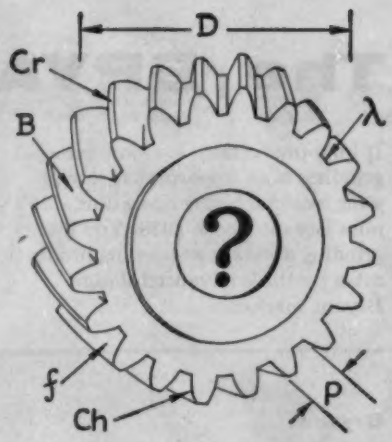
EX-CELL-O FOR PRECISION

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • DRILL JIG BUSHINGS • TORQUE ACTUATORS • CONTOUR PROJECTORS • GAGES AND GAGING EQUIPMENT • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ATOMIC ENERGY EQUIPMENT • RAILROAD PINS AND BUSHINGS • DAIRY AND OTHER PACKAGING EQUIPMENT

Machinery Division

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

12 NEW GEAR IDEAS SPELL BONANZA



Cut Out Surplus Setup Time

You can do exactly that with Michigan-Lorenz line of universal hobbers and shapers (Models up to 200 in.). No change gears to bother with in selecting speeds and feeds on the hobbers. Just dial them in. You can't help but get better tool life. And their ultra-rigidity spells ACCURACY.

★Who Said You Can't Make Gears Any Better?

There is a simple way to make even the best gears better – give them a final touch-up (after heat-treat) on a Michigan abrasive gear finisher. Improves the surface finish, takes out the burrs and tiny nicks from handling, pulls noise level way down. (Yes, it even corrects small lead errors.) Part of the secret is in Michigan's exclusive Roto-Lube coolant, incidentally. Ask for Bulletin 999-60.

★Tiny Grinding Wheels Do Big Job

It's fascinating to watch those tiny grinding wheels race around both ends of gear teeth on the Michigan 482 (for bevel gears) and 482A (for spur and helicals). In just seconds they deburr and chamfer the entire profile—top root and flanks—of every tooth on a gear. Ask for bulletins by machine number.

★Dial Type Loaders Cut Cycle Time

Dial type loaders which cut cycle time while protecting the machine against mis-cycling are now available on a variety of Michigan Tool machines including the Mark II gear finisher and the 999 abrasive gear finisher.

★It's Amazing What You Can Save With the Low-Cost #607

There's a bench type checking fixture that will handle gears up to six inches in diameter, will eliminate use of ball mikes, tells you if there is runout and how much, checks size to tenths and smoothness of rolling action. Ask for Bulletin 607.

★Forms Precision Spline and Thread in Seconds

Did you know you could perform multiple operations—like spline and thread rolling—in a single stroke of a Roto-Flo machine? It's being done successfully in regular production. What's more these machines are so versatile that they are being used for semi-job lot runs. Ask for Bulletin RF-60.

Plunge Feed Makes 1458-B Fastest Hobber

If you want to know what real hobbing speed can be, look into the Michigan 1458-B Ultra-Speed. Its infinitely variable feed rate is only part of the story. Designed for continuous production. Not recommended for job shops (a Michigan-Lorenz is best for that). Ask for Bulletin 1458-B-60.

★Play Safe With Package Tooling

Now from TWO Michigan Tool plants you can get package gear tooling engineered as a unit to give you perfect gears. Avoids such things as sharp fillets, poor cleanup, incorrect contacts, shaving cutters and master gears not being properly matched. "Package" covers hobs, shaper cutters, shaving cutters, abrasive finishers, master gears, etc.

★Now You Can Grind Crowned Gears To Tenths

A fully automatic gear grinder that maintains true involute form and produces either uncrowned or crowned gears (to radii of 0 to 12 inches). Automatic wheel dressing. Nothing for operator to do but load and unload. Highly versatile. Wide choice of setup possibilities. Roughs, semi-finishes and finishes in same automatic cycle. Ask for Bulletin CGG-60.

★A Gear Finisher You Set Up With Dials

That's what the new Mark II makes possible. And you can shave the gears straight, crowned or tapered or both tapered and crowned with just ONE attachment. More beef than any other shaver for top accuracy. Amazing ease of setup and a honey for automatic loading. Fastest cycle time. Modular construction. Plus a host of other features. Ask for Bulletin 870-60.

Gear Checkers Go Optical

The latest lead and involute checkers now carry optical heads that not only boost accuracy but also speed up the checking process. On lead checkers ask us for Bulletin 1218A-60; on involute checkers it's 1124-60. (Yes, you can do spacing on either one.)

★World's Fastest Gear Cutting Machine Now Has Through Feed

For cutting spur gears, splines, ratchets and other toothed forms there is just nothing anywhere that will touch the Shear-Speed. Now the Model #30 is available in an open double-column design, tied together across the top giving it even greater accuracy. See how easy automatic chip removal can be. Ask for Bulletin SS-60.

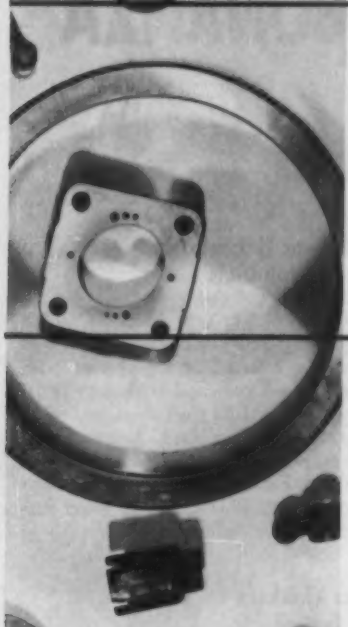
★ *On display at the National Machine Tool Exposition, Sept. 6-16.*

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS RD. DETROIT 12, MICH.

MMT·PE

The BRYANT exhibit

If high-production, low-cost internal grinding is an important factor in your manufacturing operation, don't miss Bryant Booth #936. You'll see grinding done at eye-opening production rates by these advanced-design Bryant machines.



Bryant
UNIVERSAL Internal Grinder

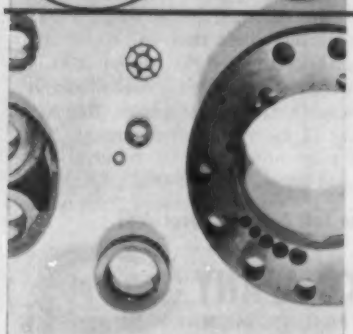
A *completely new*, low-cost, general purpose machine for I.D., O.D., internal face and rotary grinding. Incorporates many plus values not found in other low-cost machines.

Bryant MODEL "B"
MINIATURE CENTALIGN®

Miniature Centaligns will demonstrate the grinding of minute bores and raceways in miniature bearing races. The Model "B" is a truly miniaturized machine, offering such noteworthy features as Bryant's production-proven disc drive workhead, quick-change "packaged tooling", and "New Wheel Dress" mechanism.

Bryant VERTICAL CAM Grinder

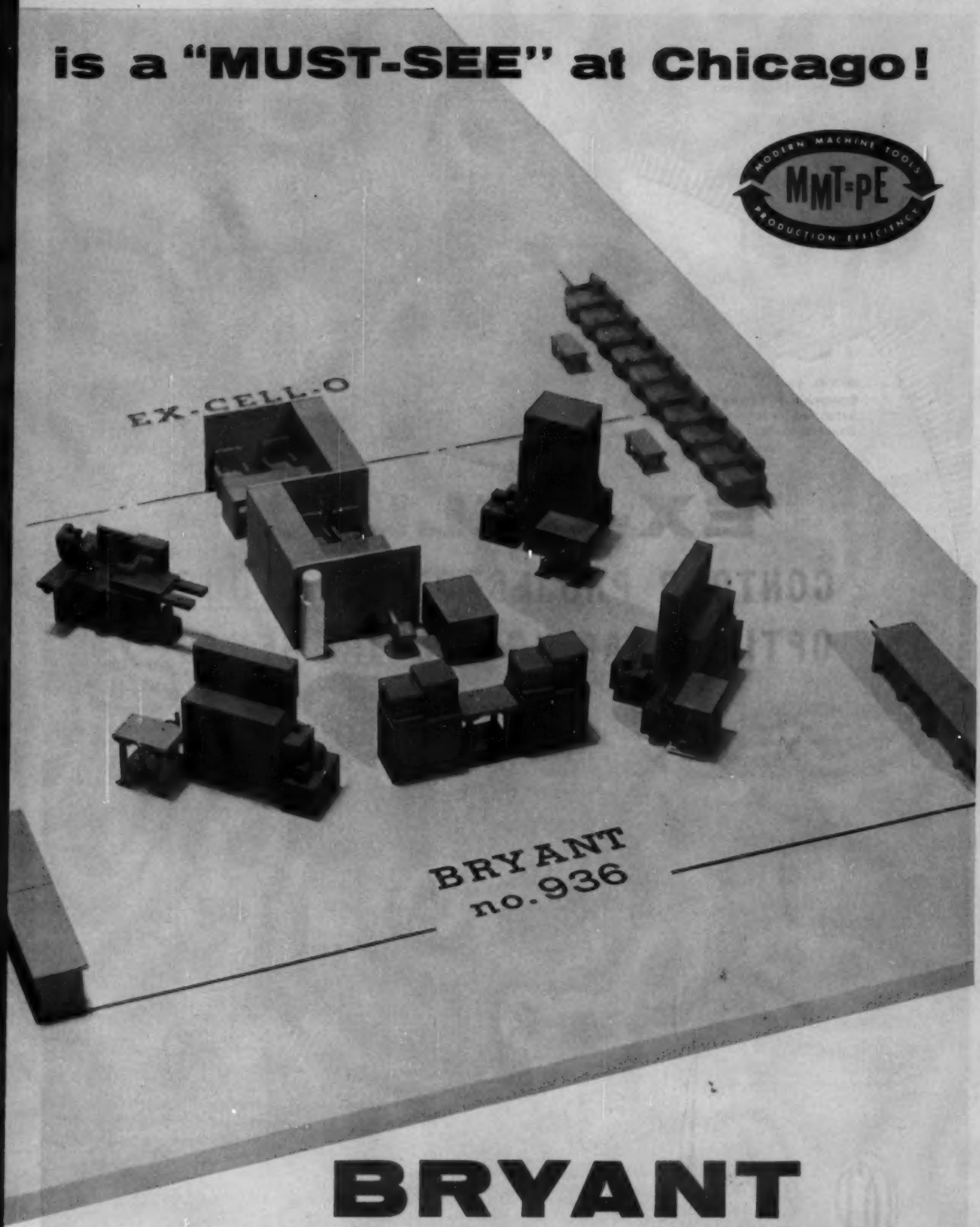
This vertically constructed machine greatly multiplies the production of contoured bores. The operation of the eccentric workholding fixtures in a horizontal plane increases production, loads faster and easier. This grinder is of Centalign unit type construction, requiring a minimum of floor space. The high-production grinding of contoured bores will be demonstrated.



Bryant MODEL "C" CENTALIGN®

The standard for dependability, speed and accuracy in the world's major production lines. Featuring the exclusive Centalign wheelslide construction, cycle control by programming cams, and time-saving, split-second work handling.

is a "MUST-SEE" at Chicago!



BRYANT

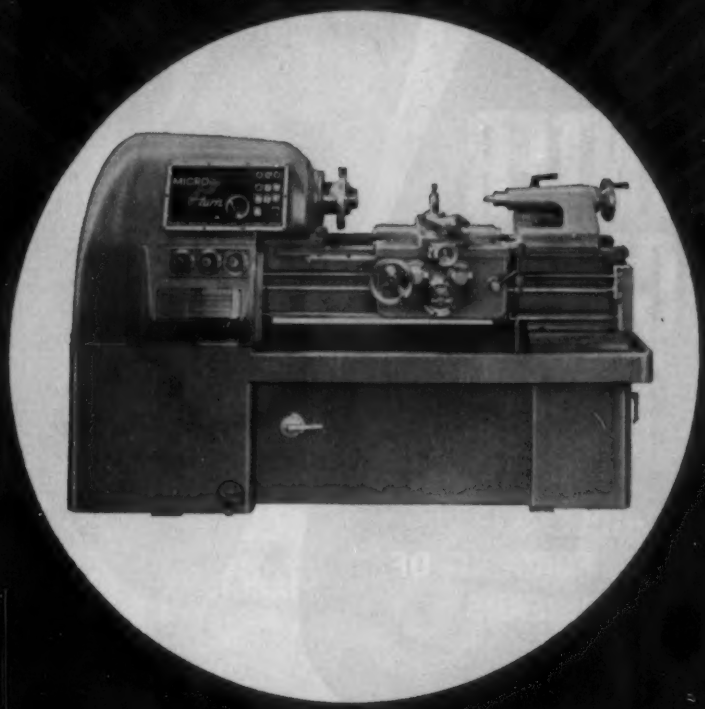
BRYANT CHUCKING GRINDER COMPANY

10 Clinton Street, Springfield, Vermont, U.S.A.

Offices: Springfield, N. J. • Cleveland • Detroit • Indianapolis • Chicago

Precision Internal Grinders • Spindles • Special Machinery and Components

MODEL 14-5
The Finest, Most Versatile, 14" Screen Contour Projector Available.
MODEL 14-2A
A Precision Measuring, Bench Model Projector for All-Around Use.
MODEL 8
Economical 8" Screen Projector. Can be used in Horizontal or Vertical Position.
EX-CELL-O
CONTOUR PROJECTORS* FIT YOUR
OPTICAL GAGING REQUIREMENTS
MMT·PE
SEE EX-CELL-O'S BOOTH 946
MODEL 30
A True, Heavy Duty Precision Measuring Projector with 30" Diameter Screen, and 12" Diameter Capacity.
MODEL 14-6
with Plain Table for Production-Line Use with Chart-Gages and Fixtures.
MODEL 14-6
with Measuring Table for Production-Line or Limited Tool Room Use.
Write for new edition of EX-CELL-O Contour Projector Booklet—Available Now!
Manufactured by EX-CELL-O Corporation at Detroit, Mich.
SOLD AND SERVICED BY
OPTICAL GAGING PRODUCTS, INC.
26 FORBES STREET ROCHESTER 11, N. Y.
(A subsidiary of EX-CELL-O Corporation)



VISIT BOOTH 1319 - DONOVAN HALL - 1960 MACHINE TOOL EXPOSITION

NEBEL LATHE DIVISION

NEBEL MACHINE TOOL CORPORATION • 3407 Central Parkway, Cincinnati 25, Ohio • *Lathe builders since 1899*

WINTER ROCKET* TAPS

FOR CHIPLESS FORMING OF INTERNAL THREADS

*Patent No. RE 24,572

WINTER

Winter Brothers fluteless 'Rocket' Taps produce superior internal threads in materials such as aluminum, brass, copper, ductile steel and die castings by chipless forming rather than by cutting. Resulting threads are extremely accurate with an excellent burnished finish and maximum strength characteristics.

Because 'Rocket' Taps actually displace metal without removing it, no chips are formed to clog flutes and cause tap breakage. Blind hole tapping is easier, faster. The absence of a cutting action virtually eliminates resharpening and assures longer tool life. A stronger thread structure is produced by compression and hardening of the metal without breaking surface fiber grains.

Stocked in all popular tap sizes, 'Rocket' Taps are available in both plug and bottoming styles from your local Winter Distributor. Call him today for complete information on this newest, cost-cutting tool from Winter Brothers. Or, write for our free, informative brochure on 'Rocket' tapping.

WINTER BROTHERS COMPANY • ROCHESTER, MICH.
Distributors in principal cities. Branches in New York
Detroit • Chicago • Dallas • San Francisco • Los Angeles

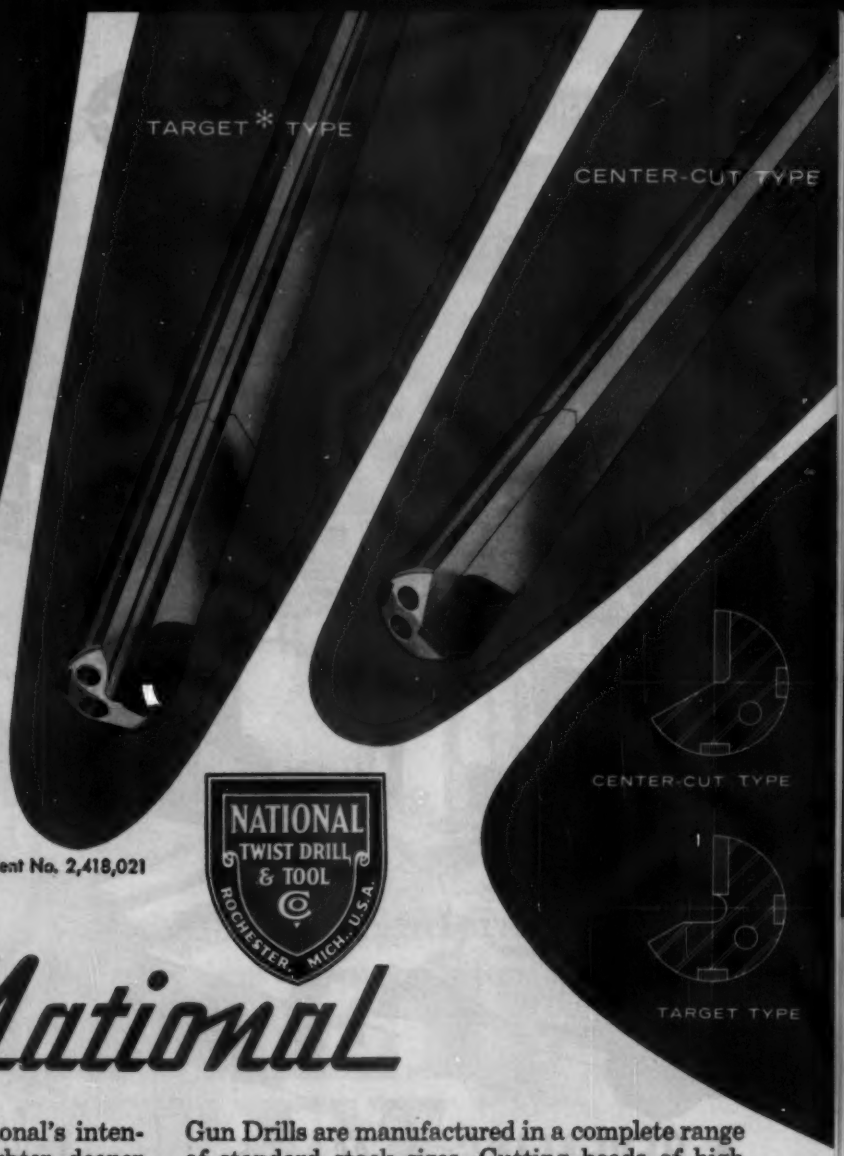
CHOOSE FROM WINTER'S WIDE LINE OF TAPS, DIES AND GAGES

CIRCLE 871 READER SERVICE CARD

CALL YOUR WINTER DISTRIBUTOR

NATIONAL GUN DRILLS*

FOR QUALITY HOLES



*Patent No. 2,418,021

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

Target Gun Drills, products of National's intensive research program, permit straighter, deeper drilling to closer tolerances than ever before. A solid core is formed that acts as a continuous center guide in the hole being drilled. Drilling performance and accuracy are vastly improved.

Center-Cut Gun Drills provide peak cutting efficiency on certain applications such as blind-hole and interrupted-hole drilling.

Gun Drill Shanks, both tubular and solid types, are of special alloy steel heat treated to a tensile strength of 194,000 psi. They provide extra-long drilling life without twist or "wind up", even at higher speeds and feeds.

Gun Drills are manufactured in a complete range of standard stock sizes. Cutting heads of high speed steel, with carbide tips, or of solid carbide are available in brazed-on construction, as well as with National's convenient Quick-Change feature for fast resharpening and replacement. Gun Reamers, Controlled Core Gun Drills, Sharpening Fixtures and Point Checking Gages are also manufactured by National, your only source for tools *plus!*

NATIONAL TWIST DRILL & TOOL COMPANY
ROCHESTER, MICH.
Distributors in principal cities. Branches in New York
Detroit • Chicago • Dallas • San Francisco • Los Angeles

*JUST TWO OF NATIONAL'S PARADE OF PLUS PRODUCTS

TWIST DRILLS • REAMERS • COUNTERBORES
END MILLS • MILLING CUTTERS • HOBS • GUN DRILLS
GUN REAMERS • CARBIDE and SPECIAL TOOLS

CIRCLE 872 READER SERVICE CARD

CALL YOUR NATIONAL DISTRIBUTOR

coming attractions . . . NMTBA show: MMT·PE

A REVEALING, "See-for-Yourself" DEMONSTRATION OF WHAT BRAND NEW KRW PRESSES CAN DO

Above is a preview of K. R. Wilson's exhibit at the coming Machine Tool Exposition. Yes, there'll be 3 brand new KRW Presses on display... and each will be in action. Here, you'll see how both standard and special press requirements can be fulfilled by KRW most profitably for you. Come... visit KRW at the show... and bring your questions along. Factory engineers will be on hand to assist you in whatever way they can. K. R. Wilson, Inc., Arcade, N. Y.

DO IT NOW! PUT BOOTH 1444 ON YOUR "MUST SEE" LIST

KRW hydraulic presses

CIRCLE 873 READER SERVICE CARD

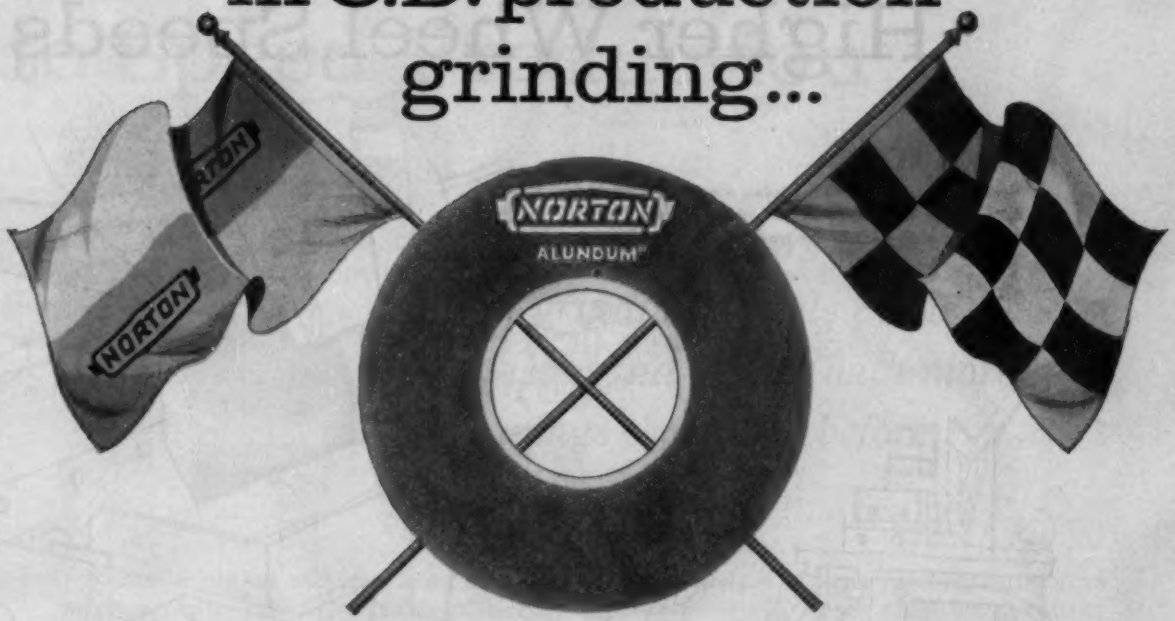
See (A) this modernized 200-ton Downstroke General Purpose Press . . . the latest version of KRW's popular 3700 Series (75-300 ton capacities).

See (B) this KRW 100-ton Opposed Ram Automatic Press at work. Designed for compacting refractory materials, abrasives, powdered metals, etc. Equipped with shuttle feed, hopper mechanism and automatic lubricator. (Capacities range from 20 thru 750 tons.)

See (C) this new KRW 4-Column High Speed Downstroke Press in operation. Designed primarily in 10- thru 50-ton capacities for trimming operations (die casting flash, rubber, plastics, etc.). Basic design also adaptable to numerous operations such as light blanking, forming and die tryout.

BIG NEWS

in O.D. production grinding...



You Can Now Get Norton Grinders With

HIGHER WHEEL SPEED

SEE THEM AT THE SHOW

Watch Norton Grinders Running at 8500 SFPM!

Learn how their greatly stepped-up speed
brings you new production benefits...

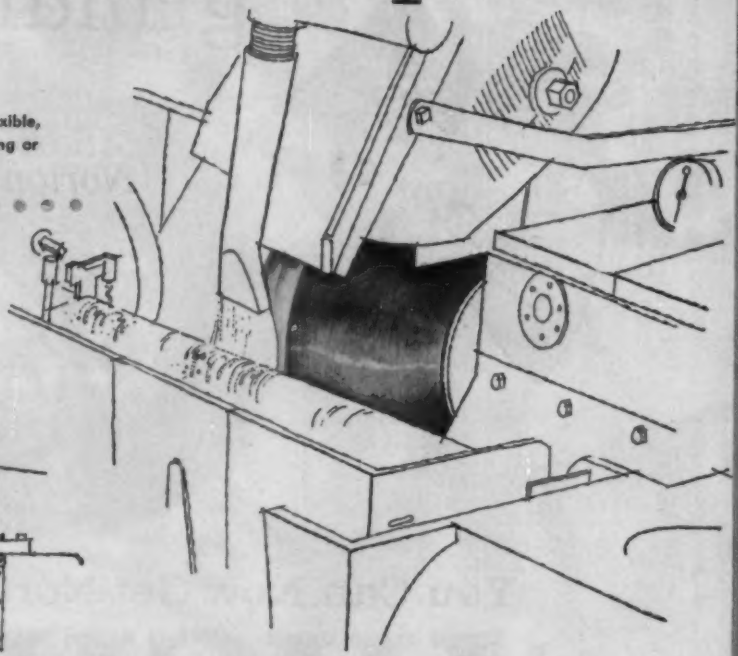
NORTON

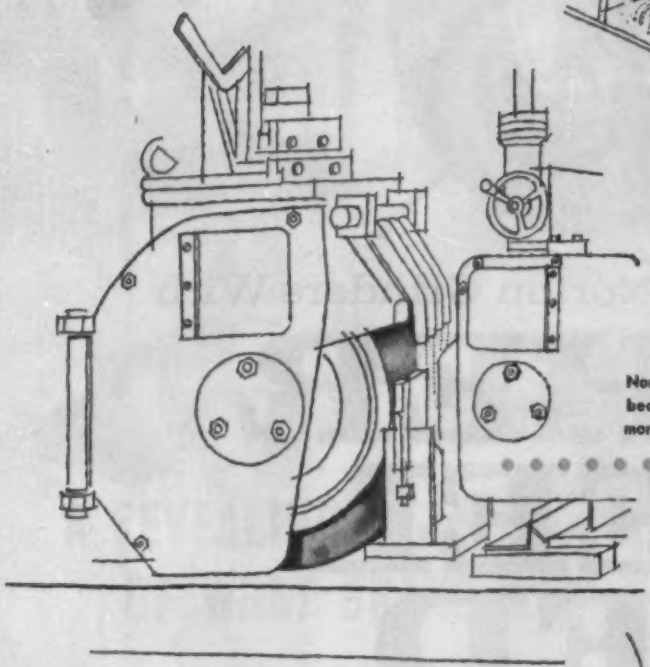
Booth No. 651.
At the 1960 NMTBA Show

Announcing:

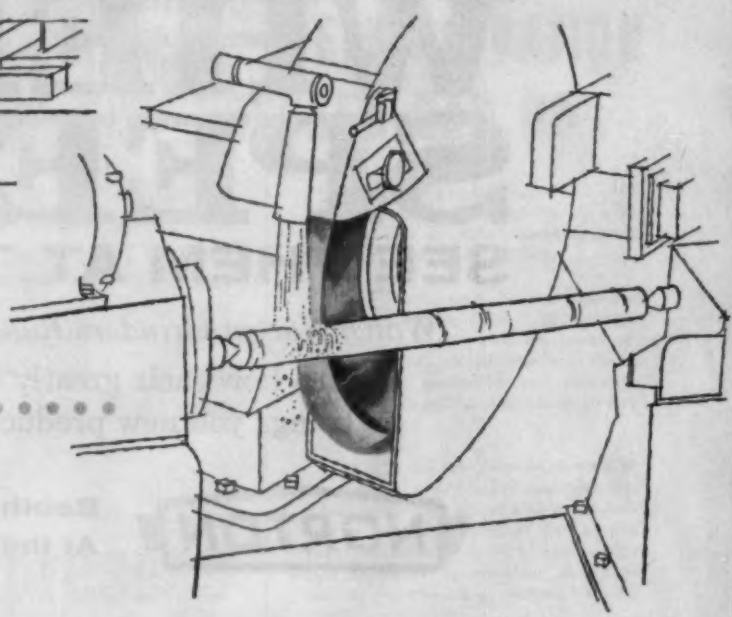
Higher Wheel Speeds

Norton Type CTU cylindrical grinders are fast, flexible, accurate. For single wheel or multi-wheels, roughing or finer finish, plunge or traverse type operations.





Norton No. 2 centerless grinder is outstanding for its straddle-bearing support of grinding and regulating wheels for faster, more consistent sizing.



Norton Type CP-1 PLUNGE-O-MATIC grinder designed solely for automatic plunge grinding, assures low unit cost production through fast, steadily paced action.

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

to Speed Production

Norton grinders with Norton grinding wheels at 8500 SFPM grind faster and better, with more savings than ever before.

Norton comes up with this latest advancement only after exhaustive testing of Norton machines and Norton wheels at the new higher speeds.

In test after test Norton machine-wheel teams proved their ability to grind at 8500 SFPM — *not only with safety, but with more advantages than were ever obtained under the previous limitation of 6500 SFPM.*

That's why important Norton cylindrical production grinders — Type CTU, plus the No. 2 Centerless, plus Type CP-1 PLUNGE-O-MATIC® — are now available with wheel speed ranges stepped up to 8500 SFPM.

New Norton High-Speed Production Benefits

Higher Productivity. Increasing SFPM by 30% reduces grinding time by about one-third and increases pieces-per-hour.

Finer Surface Finish. On most cylindrical jobs, the new higher wheel speed means a finer finish. On Norton machines this advantage is now available to you.

Longer Wheel Life. 8500 SFPM cuts down number of wheel dressings needed thereby increasing the production life of the wheel.

Lower Wheel Cost. Longer wheel life means more pieces-per-wheel, longer wheel use per dollar and thus lower operating cost per wheel.

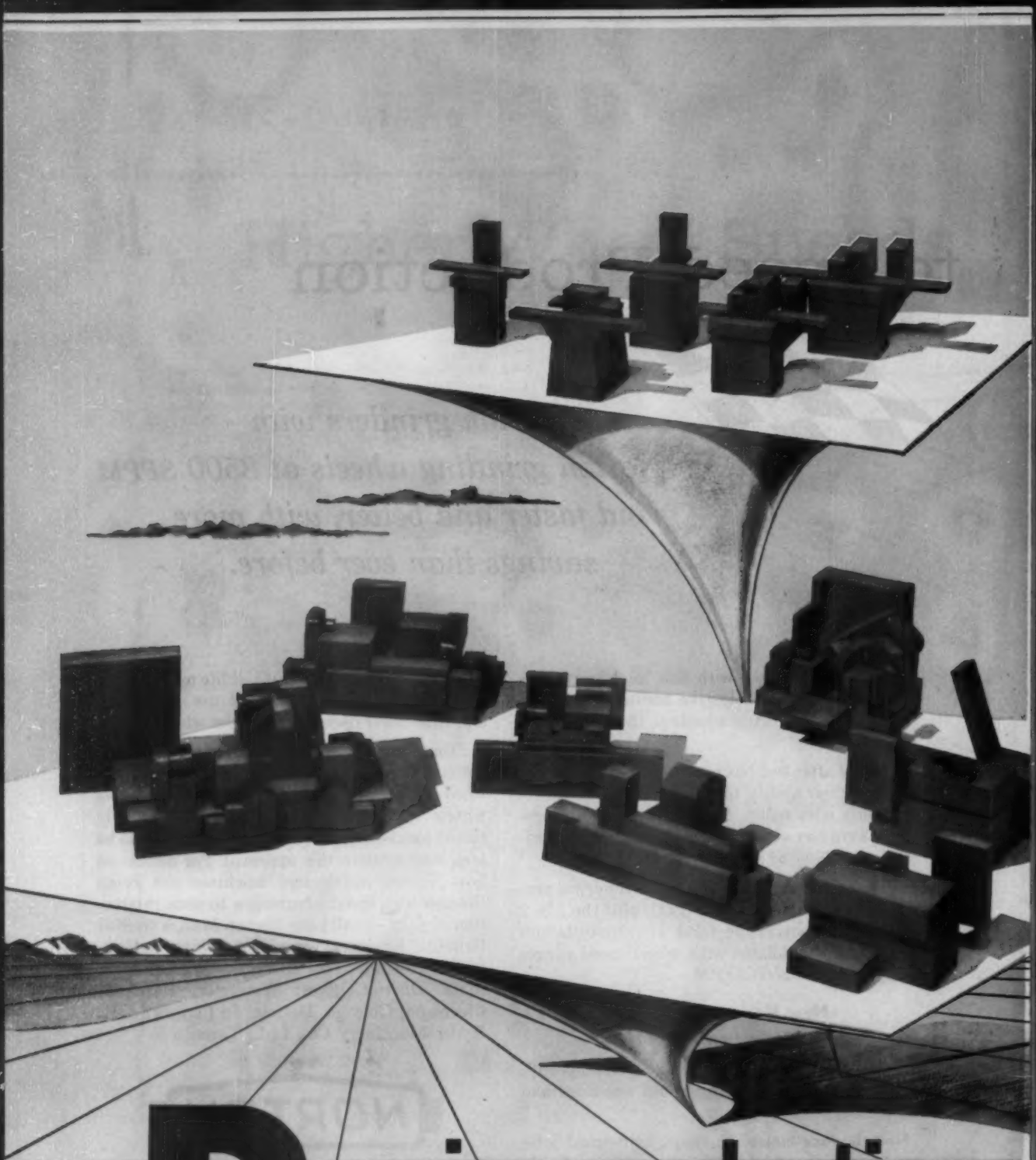
From now on Norton grinders arranged for the new maximum of 8500 SFPM will be so identified by an attached plate. Norton grinding wheels of the types approved and specially tested for the higher operating speed will also be identified to show this approval. For details on how Norton wheels and machines can bring the new high speed advantages to your production — *fast!* — call your Norton Man, a trained Grinding Engineer. Or write to NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. *District Offices:* Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

NORTON

75 years of...

Making better products... to make your products better

MACHINE TOOL DIVISION: Grinding and Lapping Machines — G & E DIVISION: Shapers • Gear Cutting Machines • Gear Induction Hardeners



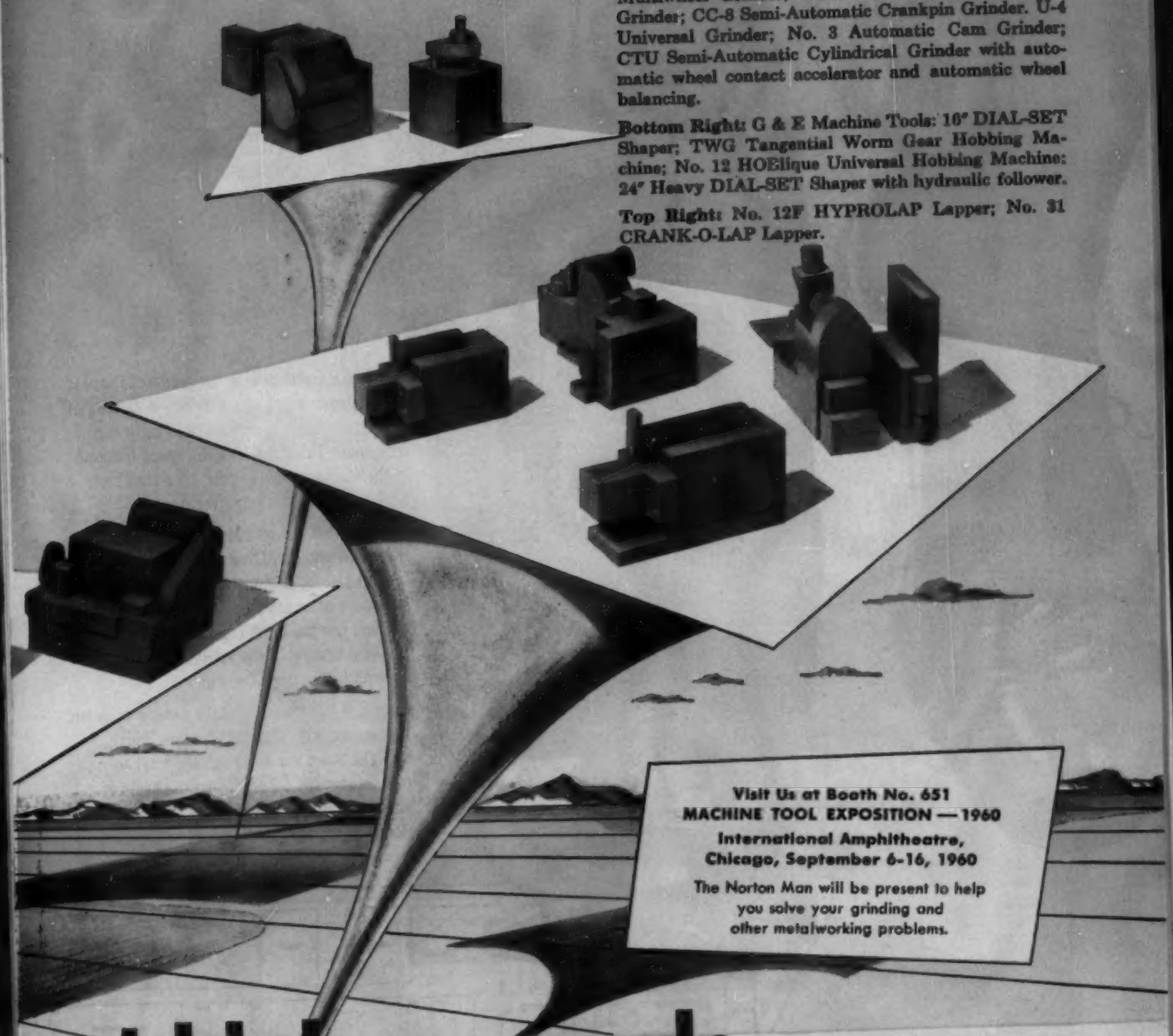
Precise production

See these new Norton Machines *in action* in Booth No. 651!

A *new* MULTI-WHEEL Grinder grinding main bearings . . . the *new* CC-8 CRANK-O-MATIC with automatic table indexing for crankpins . . . and the new No. 31 CRANK-O-LAP lapping all bearings and pins at one time . . . *all* on a three-machine transfer line.

See S-3 Hydraulic Surface Grinders running at **150 FPM** *for the first time.* The most efficient 15 H.P. cylindrical grinder, the PLUNGE-O-MATIC . . . a new Cutter and Tool Grinder with tilting wheel head for fastest set-ups on toughest jobs . . . and two brand-new Hand Surface Grinders with outstanding sizing and finishing ability.

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals • BEHR-MANNING DIVISION:



Top Left: NEW No. 200 Cutter and Tool Grinder; NEW 6 and 10" Type TS Hand Surface Grinders; NEW 6 and 8" S-3 Hydraulic Surface Grinders.

Bottom Left: NEW No. 2 Centerless Plunge and Thrufeed Grinders; NEW CM-2 Semi-Automatic Multiwheel Grinder; NEW CP-1 Hydraulic Plunge Grinder; CC-8 Semi-Automatic Crankpin Grinder. U-4 Universal Grinder; No. 3 Automatic Cam Grinder; CTU Semi-Automatic Cylindrical Grinder with automatic wheel contact accelerator and automatic wheel balancing.

Bottom Right: G & E Machine Tools: 16" DIAL-SET Shaper; TWG Tangential Worm Gear Hobbing Machine; No. 12 HOBlique Universal Hobbing Machine; 24" Heavy DIAL-SET Shaper with hydraulic follower.

Top Right: No. 12F HYPROLAP Lapper; No. 31 CRANK-O-LAP Lapper.

Visit Us at Booth No. 651
MACHINE TOOL EXPOSITION — 1960
International Amphitheatre,
Chicago, September 6-16, 1960

The Norton Man will be present to help you solve your grinding and other metalworking problems.

at higher speeds

Plus other Norton exclusives like . . . *Automatic Wheel Contact Accelerator* to shorten grinding cycle and save dollars. *Ultra-Precise Wheel Balancing* in just five seconds! Automatic Face & Radial Truing device that perfectly blends face and radii, *without machining lines.*

AND THESE G & E MACHINES: 1. Two new DIAL-SET Shapers — *real time savers!* 2. New HOBlique Hi-Speed Gear Hobber — eliminates need for feed and lead change gears, lead screw, and differential.

In short, see how *you* can speed up your precision production. NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. *District Offices:* Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

NORTON
MACHINE TOOLS
75 years of . . .
making better products . . . to make your products better

Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes • MACHINE TOOL DIVISION: Grinding and Lapping Machines — G&E DIVISION: Shapers • Gear Cutting Machines • Gear Induction Hardeners

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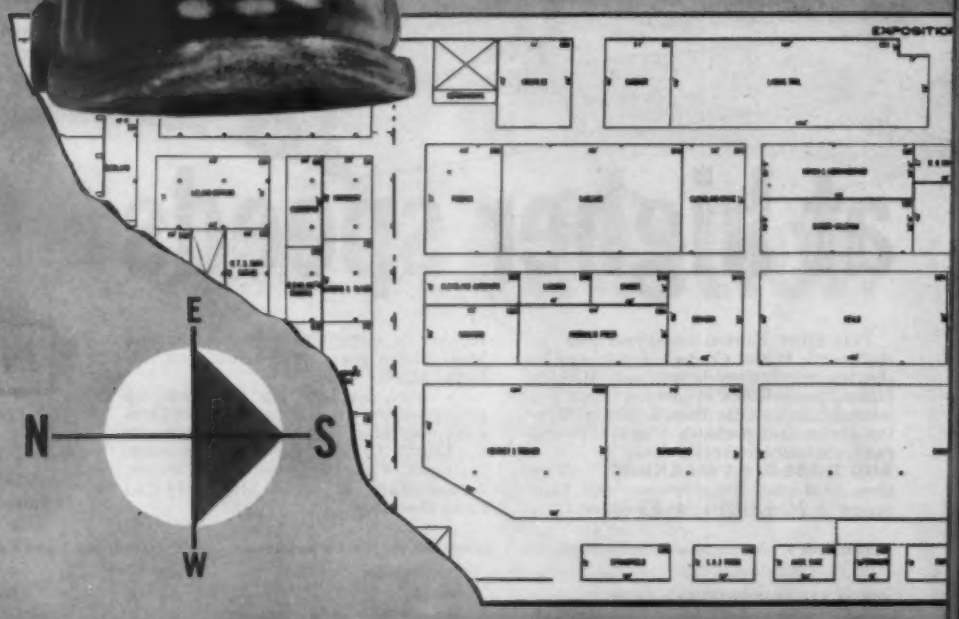
CIRCLE 879 READER SERVICE CARD ►

point

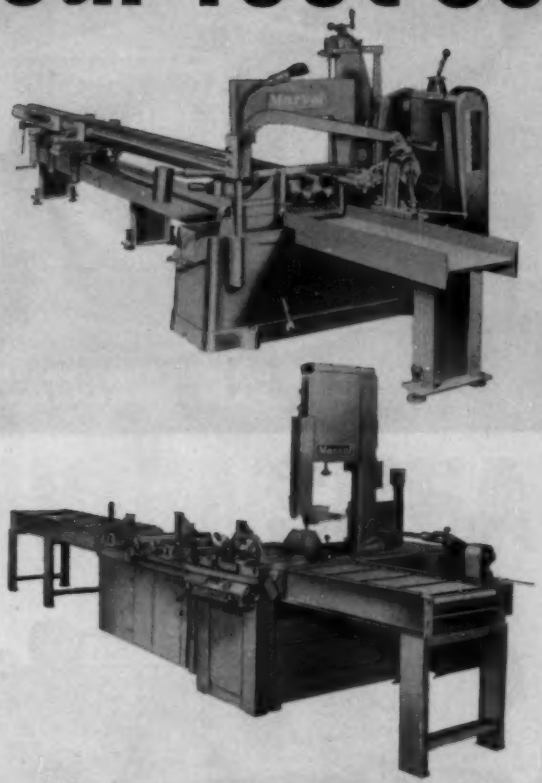
Don't take metal sawing for granted! There is more opportunity to save money in cutting off operations today than ever before. To see why, make 1340, the **MARVEL** space location in the Machine Tool Exposition a **sure** stop when you're in the Amphitheater.

Tons of steel will be cut-up by 14 **MARVEL** Hack Saw and Band Saw Machines in the largest sawing demonstration ever made — anywhere or at anytime. Among other things, you will see the most important development in metal sawing — the **MARVEL** "Sure-Line" Automatic Accuracy Control.

Finally, if you have a specific sawing problem, we can prove to your satisfaction, that **MARVEL** Saws are designed and built to outperform any other saw on the basis of speed, accuracy, and cost per cut. Come in and see!



your feet south to space



1340

to see the LARGEST, MOST
COMPLETE SAWING DEMONSTRATION
in the Amphitheater

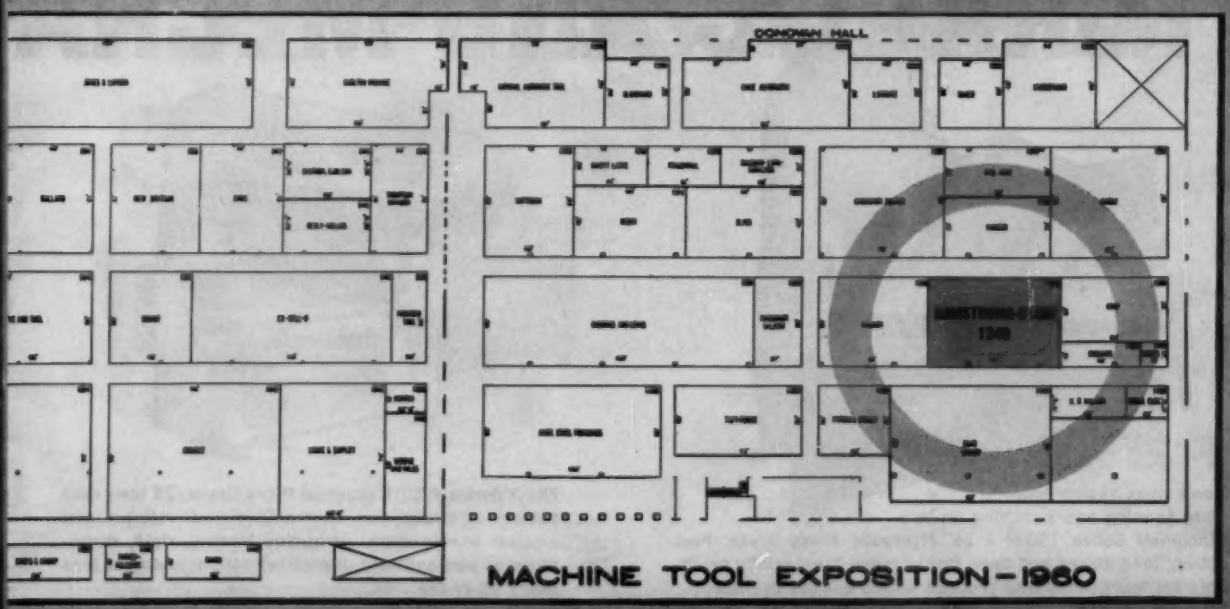
Be sure to see the
MARVEL *"Sure-Line"* (patented)
AUTOMATIC ACCURACY CONTROL

MARVEL *Metal Cutting* **SAWS**

Better Machines–Better Blades

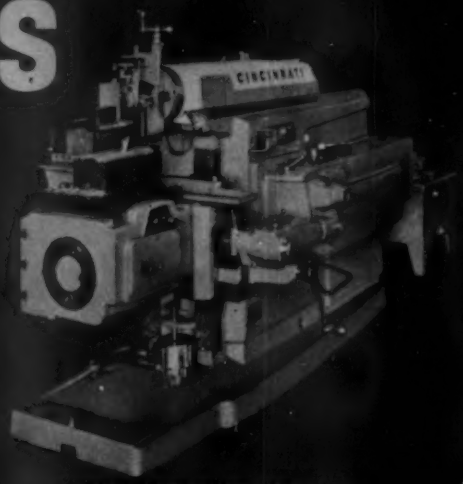
ARMSTRONG-BLUM MANUFACTURING COMPANY

5700 WEST BLOOMINGDALE AVENUE — CHICAGO 39, ILLINOIS



RIGID SHAPERS

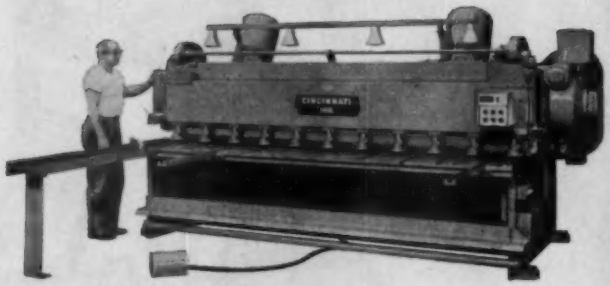
Fast and accurate metal removal will be exhibited by the Cincinnati 24" Rigid Shaper—see it cut 2" deep at .030" feed



This 16" Cincinnati Duplicating Shaper demonstrates automatic tracing from a simple sheet metal template.

HYDRAULIC AND MECHA

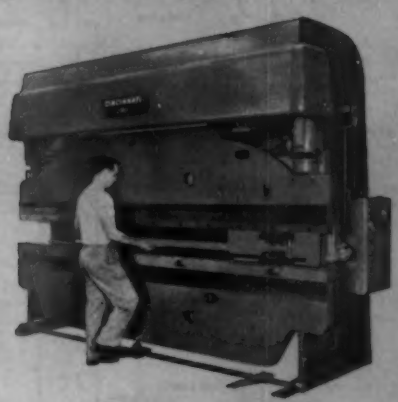
This new ¾" x 12' Cincinnati Hydraulic Shear, with adjustable rake from 0" to ¾" per foot, will cut from relatively thin sheets up to ¾" mild steel plate.



Check the fast, accurate sheet shearing performance of this Series 1410 Cincinnati Shear (3/16" x 10' mild steel capacity) equipped with a magnetic sheet support.

HYDRAULIC AND MECHA

Don't miss seeing both plate forming and punching on this Cincinnati Series 750-H x 16' Hydraulic Press Brake. Fast set-up, long stroke and deep throat make it especially profitable for fabricators who produce varied shapes in plate.



The 3 Series x 10' Cincinnati Press Brake, 75 tons near bottom of stroke, has all the Cincinnati refinements: all-steel construction, centerline loading, rigid, micro-crowned bed and ram, motorized ram adjustment plus many other features.

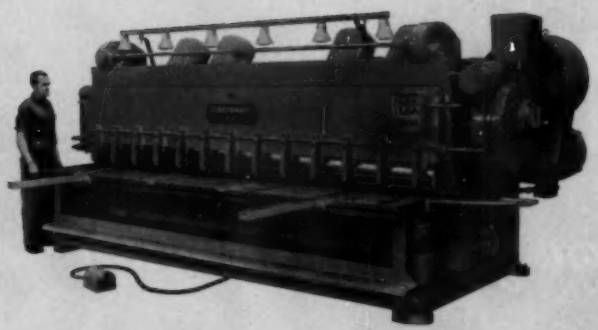
All in action at

THE CINCINNATI SHAPER CO.

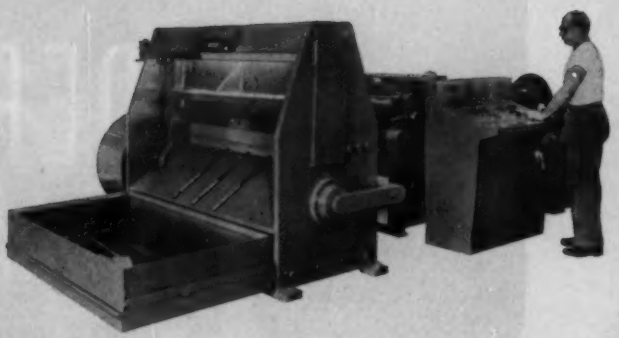
BOOTH 1230

Machine Tool Exposition—1960, Chicago, International Amphitheatre, September 6-16

NICAL SHEARS



Speed up your plate cutting jobs with Cincinnati mechanical plate shears, represented by this Series 4312 Cincinnati Shear (¼" x 12' mild steel capacity).



See this new Cincinnati Hi-Speed Shear cut 18 ga. x 24" coiled stock at 200 strokes per minute. Used in conjunction with automatic coil-feeder-straightener.

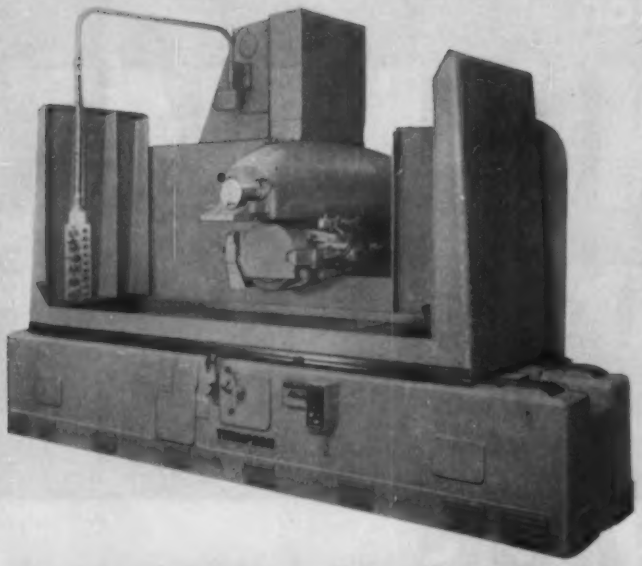
NICAL PRESS BRAKES

The new 225 ton, 9 Series x 10' Cincinnati Automatic Cycle Press Brake demonstrates high-speed sheet metal forming without "clutch-slipping," "whip-up" or "back-bends." See the first real solution to high speed production with automatic bending action.

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow



THOMPSON
TYPE CX PLUNGE-MATIC GRINDER
36″ x 48″ x 72″

This grinder features Thompson's new and exclusive "CYBERMATIC PENDANT CONTROL" which completely eliminates the wheel head elevating hand wheel. All vertical movement of the wheel head, both automatic and manual, is accomplished effortlessly by dials on the pendant control.

MODERN

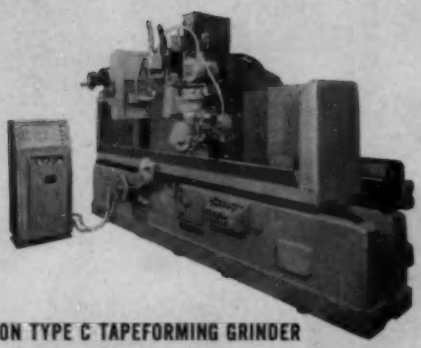
to increase your production

THOMPSON TYPE SUPER B GRINDER
12″ x 16″ x 36″

The outstanding feature of this Super B Thompson grinder is the 10 HP in-built wheel head motor on a spindle equipped with the world famous MALCUS BLOCK BEARINGS. These bearings are *pre-loaded—self-adjusting—cold running—rotationally stable—vibrationless and free from wear.* Other features are: Dial type cross feed with 14″ of stroke—Tape bed way covers —Thompson Hydra-Cool Hydraulic System with separate hydraulic sealed oil sump—Electro-Autosizing in-process gauging for solid or interrupted work surfaces with automatic spark out to move table to loading position with Autosizing gauge control.

THOMPSON TYPE 2F GRINDER
8″ x 12″ x 24″

Equipped with a 3 HP 1800 RPM wheel head and a 12″x 1″x 4″ grinding wheel, special features on this machine include a table mounted double roll wheel crushing device consisting of 1 work roll and 1 master roll with timed dressing cycle for wheel crushing —9″ wheel head cross feed travel—5 to 90 FPM table speed using Thompson Hydra-Cool Hydraulic System.



THOMPSON TYPE C TAPEFORMING GRINDER
14" x 28" x 60" with 10" of vertical or horizontal form control

Numerical control consists of Thompson-Ramo-Wooldridge, Inc. Director System utilizing 8-channel punched tape with transistorized module-construction. This system provides numerical control to 3 axes of which 2 axes are selective. Wheel head spindle can be rotated in a horizontal plane for template grinding with a large diameter wheel.

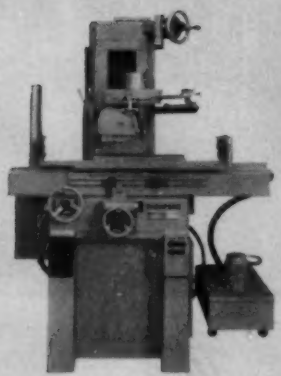
This machine is designed for grinding sophisticated continuous path contours.

THOMPSON TYPE C
ELECTROLYTIC FORM AND FACE GRINDER
18" x 28" x 48"

This machine is equipped with a 3000 ampere ANOCUT electrolytic power unit using formed 16 pitch 90° serrations in an 18" dia. non-diamond wheel. A stock removal rate as high as .250 cu. in. per minute can be accomplished on the super alloy tool steels with this new electrolytic grinder.

MACHINE TOOLS

efficiency



THOMPSON TYPE D GRINDER
6" x 14" x 18"

This grinder features TRAVATROL power feed to the table without the use of table reverse dogs. Table stroke is controlled by dials set from a scale reading located on front of table. Table speed is infinitely variable from 12 to 35 feet per minute with manual feed also provided. Other features include: A head mounted Hoglund contour dresser manually operated from template with a 10 to 1 ratio covering a contour 1" wide and ½" deep.

THE THOMPSON GRINDER COMPANY • SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

MMT PE

SURFACE GRINDERS

How long is it

FROM GOLDEN OPPORTUNITY...

50

TO GOLDEN ANNIVERSARY ?

Time-wise it is fifty years. Fifty of the most exciting, progressive years in our nation's history.

From a technical standpoint it appears much longer, so tremendous are the changes that have been wrought in the machine tools of today vs. those of yesteryear.

Men of vision incorporated the Lees-Bradner Company in October of 1909. They recognized the need for better cutting machines and grasped their golden opportunity to improve gear generating methods. Men of vision have carried on ever since, perfecting those early machines and winning for Lees-Bradner the most respected position in the hobbing machine industry.

Yes, we're fifty years young—and growing younger every year with fresh, new ideas that multiply the efficiency of Lees-Bradner machines.

Many thanks to our thousands of good customers who, years ago and since, gave us the "golden opportunity" to reach this, our "golden anniversary."

See the new Lees-Bradner 12-HD and the efficient 7-HD Hobbing Machines at the Machine Tool Exposition BOOTH No. 481

IMPROVING GEARS . . . FOR 50 YEARS!

the

LEES-BRADNER
Company

CLEVELAND 11, OHIO, U.S.A.

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Machine Tool Exposition
Sept. 6-16 Chicago

NIAGARA BOOTH 1330

MMT-PE

a whole press and shear show in itself!

Once again, Niagara has come through with the "newest of the new"! Never before have so many new developments in metal forming and shearing machines been planned into so large an exhibit area. All told, there'll be a "live" show of a dozen machines in operation . . . many engaged in actual production.

From aisle to aisle, here is an action-packed exhibit that will prove especially profitable to press, press brake, and shear users looking for new ways to boost production, improve work quality, and cut costs. Key men from Niagara (yes, top management, too) will be on hand to welcome you and answer questions on-the-spot. Come. Visit Niagara. Allow plenty of time. See all there is to see.

NIAGARA

NOW TURN THE PAGE for a glimpse of what you'll see in Booth 1330

. . . AND they'll all be in action at the Machine Tool Exposition

Mech. Sleeve Clutch OBI Press with forming die and demonstration of Niagara Portable Tonmeter

60-ton Inboard Drive Mech. Press Brake. Will perform several operations with multi-deck forming die

100-ton Double Crank Straight Side Fully Automatic Press with progressive die. Will be shown in production along with Niagara's Load Monitor

Underdrive Power Squaring Shear. 10 gage capacity. 96" cutting length

Sliding Bolster Front to Back Crankshaft OBI Press. Will produce giant bottle openers with 2 quick change dies

150-ton Double Crank Straight Side Press with 9 station transfer feed

250-ton, 2 pt. suspension, Straight Side Eccentric Geared Press for automation line. Will produce parts with unique Adjustable Draw Die

150-ton Mech. Press Brake with alternating 2-speed stroke control. Will form bends on long sheets

45-ton Front-to-Back Crankshaft OBI Press with automatic roll feed, stock reel, & scrap cutter. Will stamp fuse tips at million/day rate

Ultra High Speed Automatic OBI Press package with progressive dies. Will operate at variable speeds up to 1000 spm producing parts at rate of over million/day

Overdrive Power Squaring Shear with 18" gap, ½" capacity, 144" cutting length

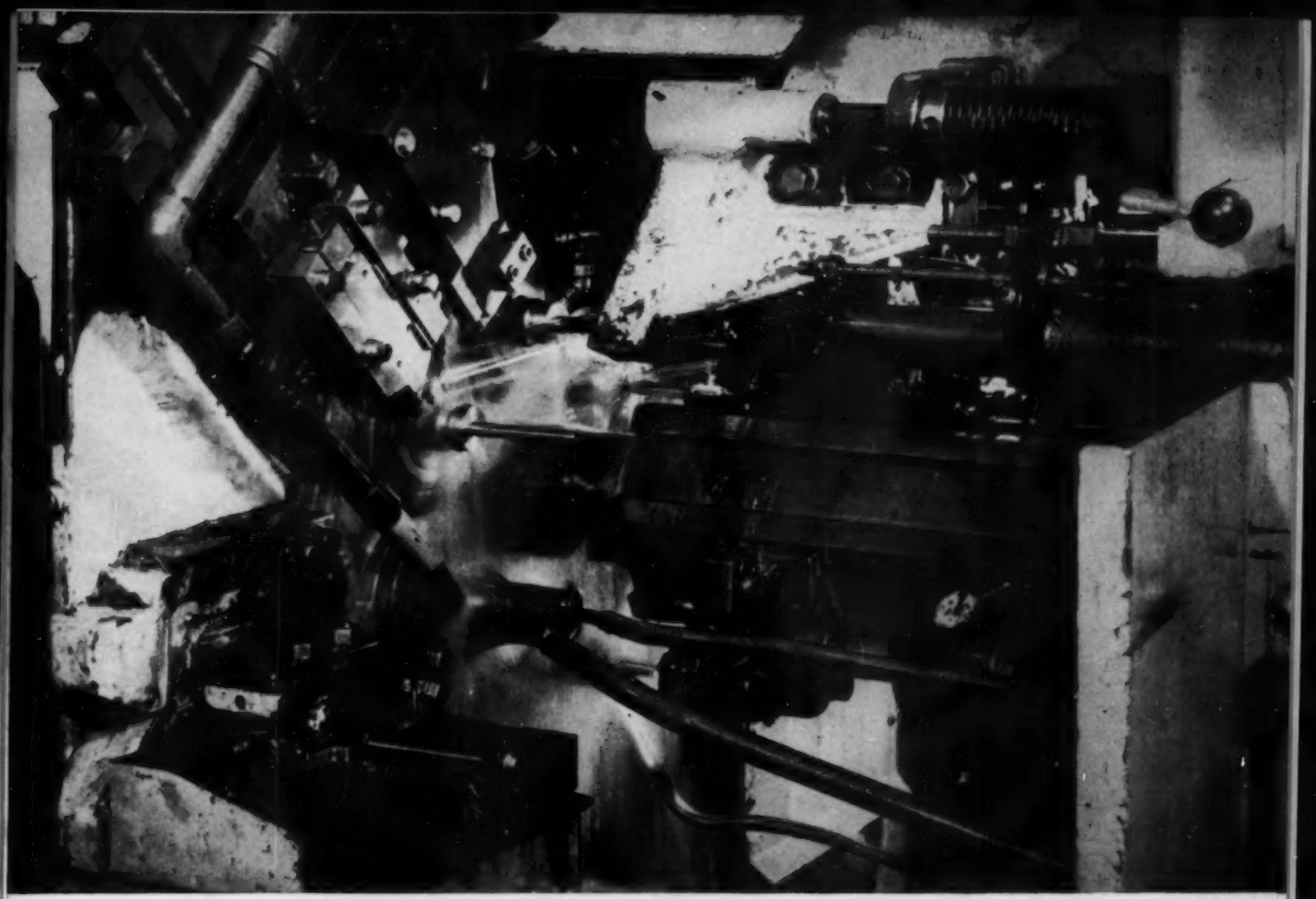
400-ton Hydraulic Press Brake to be exhibited with variety of forming dies

NIAGARA

NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.

District Offices and Distributors Everywhere

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work



TOUGH, ON-THE-JOB TESTS LIKE THESE CONVINCE USERS

Texaco Cleartex Performs Better

ON BOTH CUTTING AND LUBE SIDES!

Company A: a leading bearing manufacturer (name on request).

Job: forming and cut-off of 52100 and C-1118 tube stock for bearing races.

Had been using: three petroleum products; one on lube side, one on cutting side, one to build up cutting oil diluted by lube oil.

TEST: Texaco Lube Engineer recommended dual-purpose Cleartex 140 for *both* cutting and lube sides of 2⅝" Conamatic for thirty day trial.

RESULTS: better finish, improved tool life, no dilution of cutting oil. Company switched *all 30 automatics* to Cleartex. After 6 months, no addition of base oil needed!

Company B: a well-known maker of cable (name on request).

Job: machining 303 Stainless brake cable nipple.

Had been using: three products—lube oil, cutting oil and base oil.

TEST: Texaco Lube Engineer recommended Cleartex 140 for *both* cutting and lube sides of 1⅝" six spindle Greenlee.

RESULTS: after two weeks, company began gradual switch-over of *all 22 automatics* to Cleartex! Got better tool life, improved finish on wide variety of steels, stainless and brass! Six months later—no compounding needed, even after tapping tough stainless!

A Texaco Lubrication Engineer will help you select the Cleartex grade which can give you similar results on your automatics. Just call the nearest of the more than 2,300 Texaco Distributing Plants, or write:

Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

TEXACO

Throughout the United States

Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

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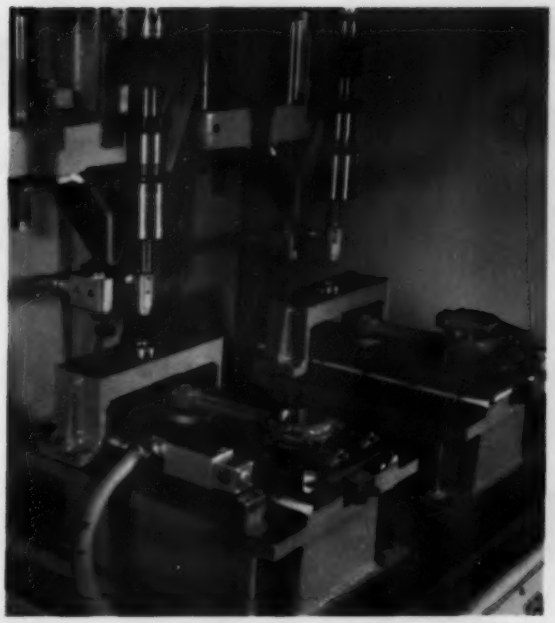
NATCO
NATCO

Short-bore production honing finally gets its own machine tools—sturdy Natco/Jes-Cal mechanical honing machines built to maintain honing tolerances under continuous production conditions.



NEW

Natco Heavy Duty Production Honing Machines

Pinion gears, connecting rods, rocker arms, compressor components—Natco/Jes-Cal mechanical honing machines have been developed for better honing of just such parts as these.

These new machines are designed to use production-proven Jes-Cal honing tools with the exclusive, automatic, plug-gage method of size control. Add the sturdiness and tolerance-holding stability of Natco machine design and you know why these are machines to end your production honing problems.

They will hone any bore from ½″ to 3″ in length and up to 3″ in diameter. Rotational speeds of 200 to 800 rpm and reciprocation from 60 to 240 strokes per minute are fixed by pick-off gears. Stroke length up to 3″ is adjustable in desired increments.

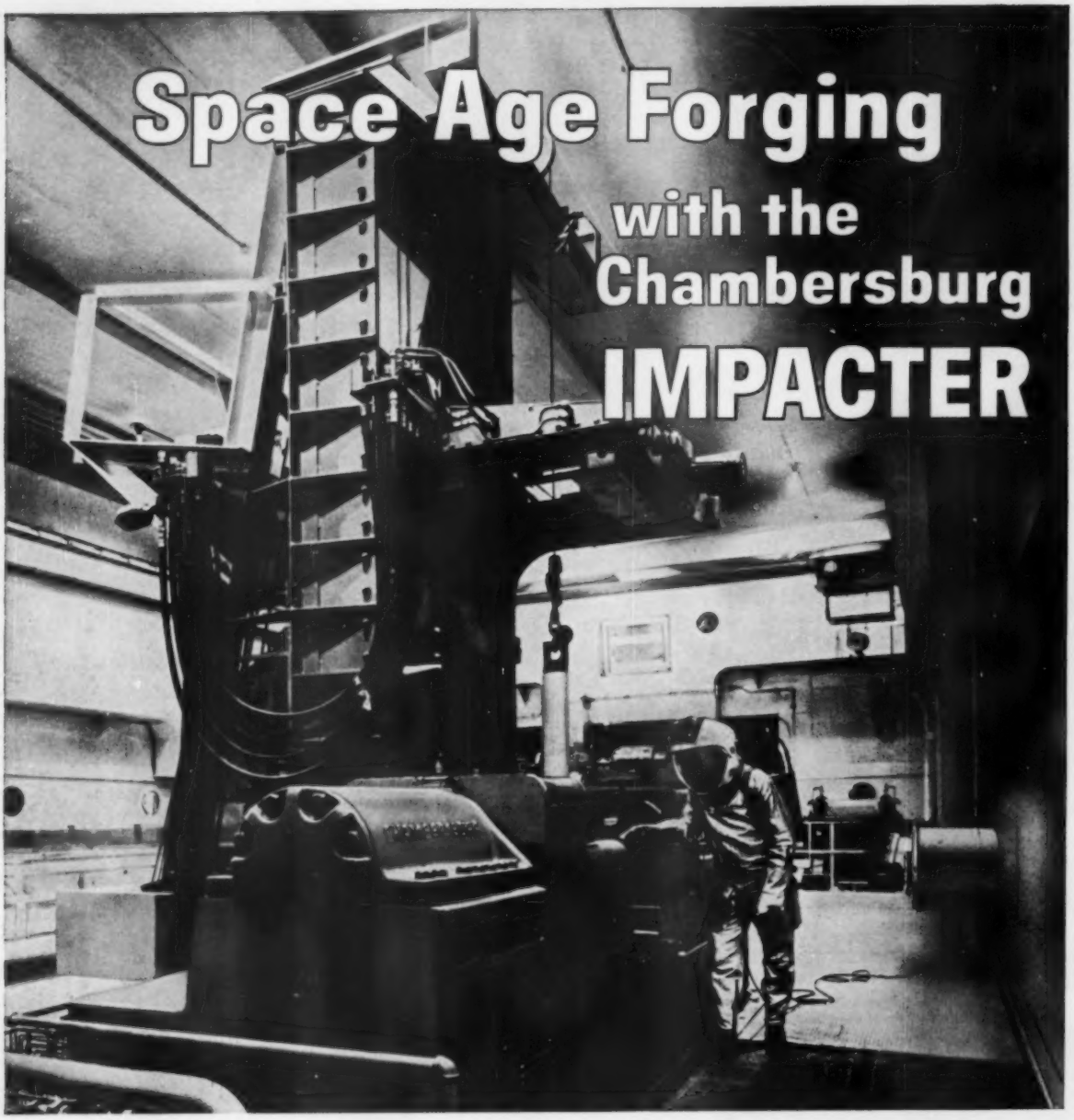
Use them singly or as multiple heads on a common base. Integrate them into your transfer line—they are fully compatible with Natco drilling, tapping, boring, and milling machines. For more facts call your Natco or Jes-Cal representative. Write for Bulletin 200.

The National Automatic Tool Company, Inc., Richmond, Indiana

NATCO

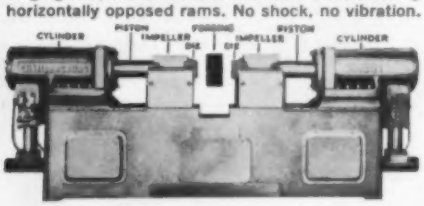
Natco/Jes-Cal mechanical honing machines can be set up singly or in batteries on a common base. They are easily integrated into a Natco fully automatic transfer line.

Is your honing problem—or something like it—in this collection? These are typical jobs honed at high production rates on the new all-mechanical Natco/Jes-Cal honing machine.



Today's forging problems will not be solved with yesterday's forging equipment

THE IMPACTER: Designed and built by Chambersburg, pioneers in the development of machinery for forming metals by impact. In this revolutionary forging tool, the stock is struck from both sides by horizontally opposed rams. No shock, no vibration.



At the amazing new InFab project of Universal-Cyclops at Bridgeville, Pa., a Chambersburg Impacter is employed to forge ingots of molybdenum and other "exotic" metals in an atmosphere of pure argon gas, in which the workers have to wear space suits. The Impacter was selected primarily because of its instantaneous impact. At temperatures up to 4500° F, the Impacter strikes the ingot on two sides with 15,000 ft. lbs. of force; yet the impact is instantaneous and the transmission of heat to the die faces momentary. Other advantages are the Impacter's lack of shock or vibration, necessitating no heavy foundations, and the thorough working of the metal, deformation taking place equally on both sides. Learn more about this modern method of forging. Write today to Chambersburg Engineering Company, Chambersburg, Pa.

CHAMBERSBURG

DESIGNERS AND MANUFACTURERS OF THE IMPACTER

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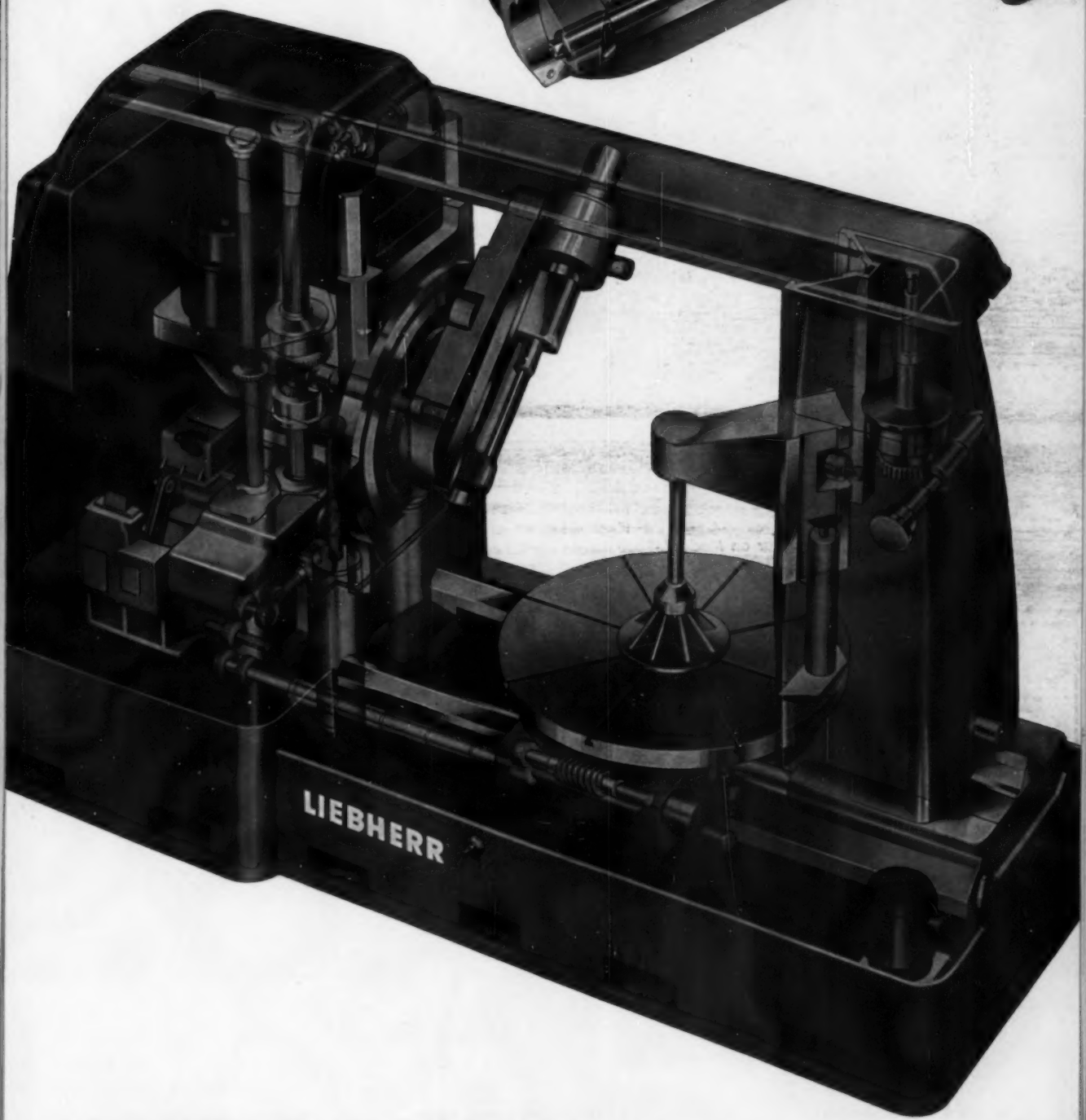
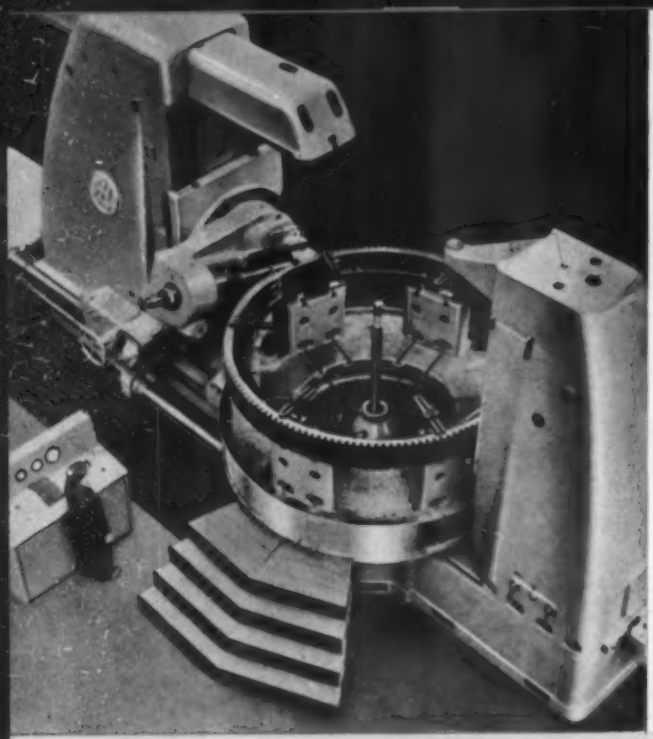
CIRCLE 891 READER SERVICE CARD

CIRCLE 892 READER SERVICE CARD

HERE'S HOW THE LIEBHERR GEAR HOBBER WORKS



to see it at work—turn the page.....



▲ Hobbing a helical ring gear on Model L-3200

Did you spot these gear hobbing features on the preceding page?

They're all yours—only in a LIEBHERR

1 **WARD-LEONARD AC-DC MAIN DRIVE provides infinitely variable hob speeds with maximum torque and highest cutting efficiency at all operating speeds.**

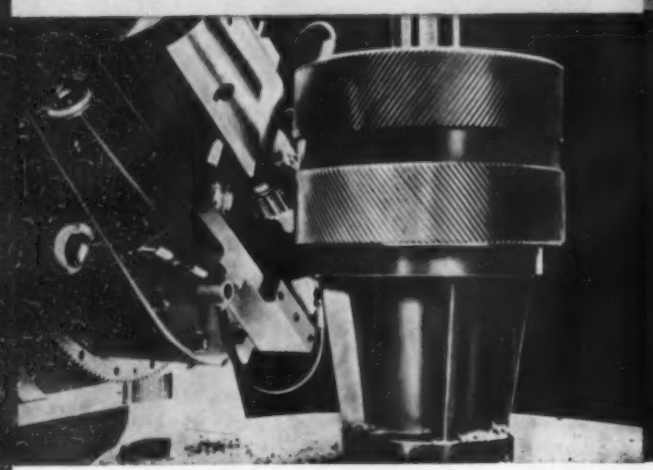
2 **SHORTEST AND MOST DIRECT DRIVE FROM MAIN MOTOR TO HOB SPINDLE delivers 70% of motor's power to hob where it is needed most.**

3 **BALANCED HOB SLIDE DESIGN—main motor acts as counterbalance to hob slide.**

These are just a few highlights of the advanced design that distinguishes LIEBHERR GEAR HOBBERS and explains why they are in the forefront of production gear hobbing—here and abroad. There are a dozen more reasons—every one illustrated in detail in our 36-page catalog. We think you'll be interested in evaluating every one of them in terms of your present or projected gear cutting procedures. May we send you a copy?

Ten Liebherr models range from 12" to 150" diameter

▶ Hobbing a radar rim gear on Model L-1800



KO CO., INC. PRECISION MACHINERY

KURT ORBAN

COMPANY, INC.

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Clearing, Division of U. S. Industries, Inc.
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Diamond Alkali Co.
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Hardinge Company, Inc.
Ingersoll-Rand Co.
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Marion Power Shovel Co.
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Morgan Construction Co.
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Northern Engineering Co.
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York Process Equipment Corp.

. . . and there are many, many others!

APPLICATIONS for bearings and bushings:

- aircraft landing gear
- turbines
- cranes
- hydraulic pumps
- air-conditioning equipment
- diesel engines
- railroad car journals
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- combination engines-compressors
- forming presses
- stationary engines
- marine engines
- track rollers
- gear reduction units
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- power shovels
- superchargers
- rolling mills
- aircraft engines
- aircraft controls
- milling machines
- automobile engines
- grinding mills

For information on aluminum bearings see your bearing manufacturer, or write Aluminum Company of America, 1839-H Alcoa Building, Pittsburgh 19, Pa. For aluminum bearing stock, see your nearest Bunting Distributor.

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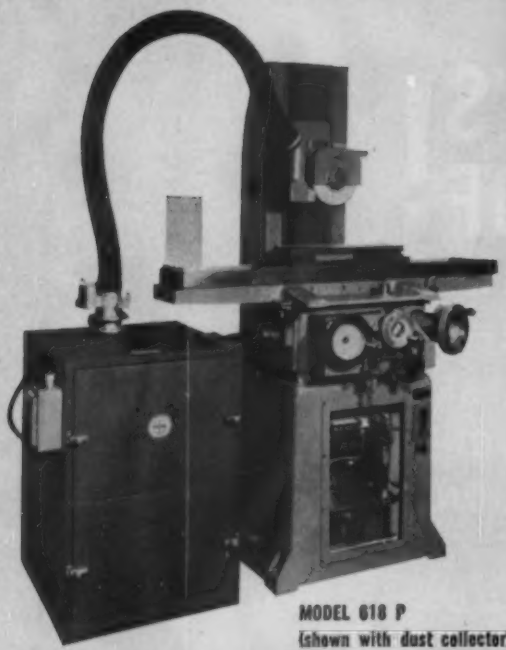
ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

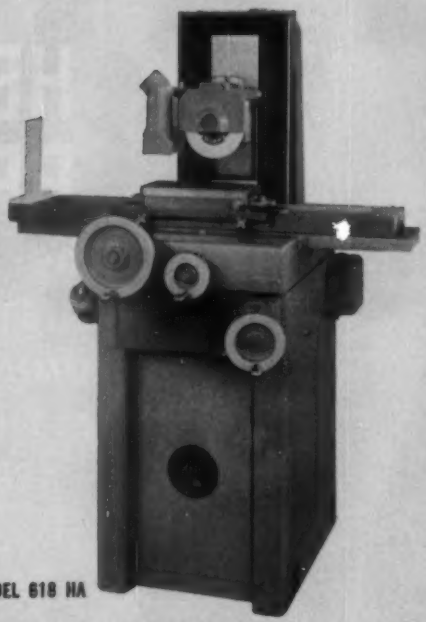
◄ CIRCLE 893 READER SERVICE CARD

CIRCLE 894 READER SERVICE CARD

TWO GREAT 618's BY REID...



MODEL 618 P
(shown with dust collector)



MODEL 618 HA

Industry's first choice for toolroom and production economy!

GREAT BECAUSE: Heavy, rugged construction provides uniformity and vibration-free performance.

7" wide cross slide travel and 20" long table travel provides maximum working surface.

Cross Slide Locks and Hard Chrome Plated Cross Feed and Elevating Screws are standard equipment.

The *REID 618P* features a power table and cross feed . . . automatic lubrication . . . accessible convenient controls.

The New *REID 618HA*, a hand operated model, provides extra high 15¼" working height under a 7" wheel . . . one shot lubrication . . . heavy one-piece cast iron base.

Leading tool rooms and production departments insist on REID . . . tops in industry for 60 years.

See these and other models at your local authorized REID distributors.
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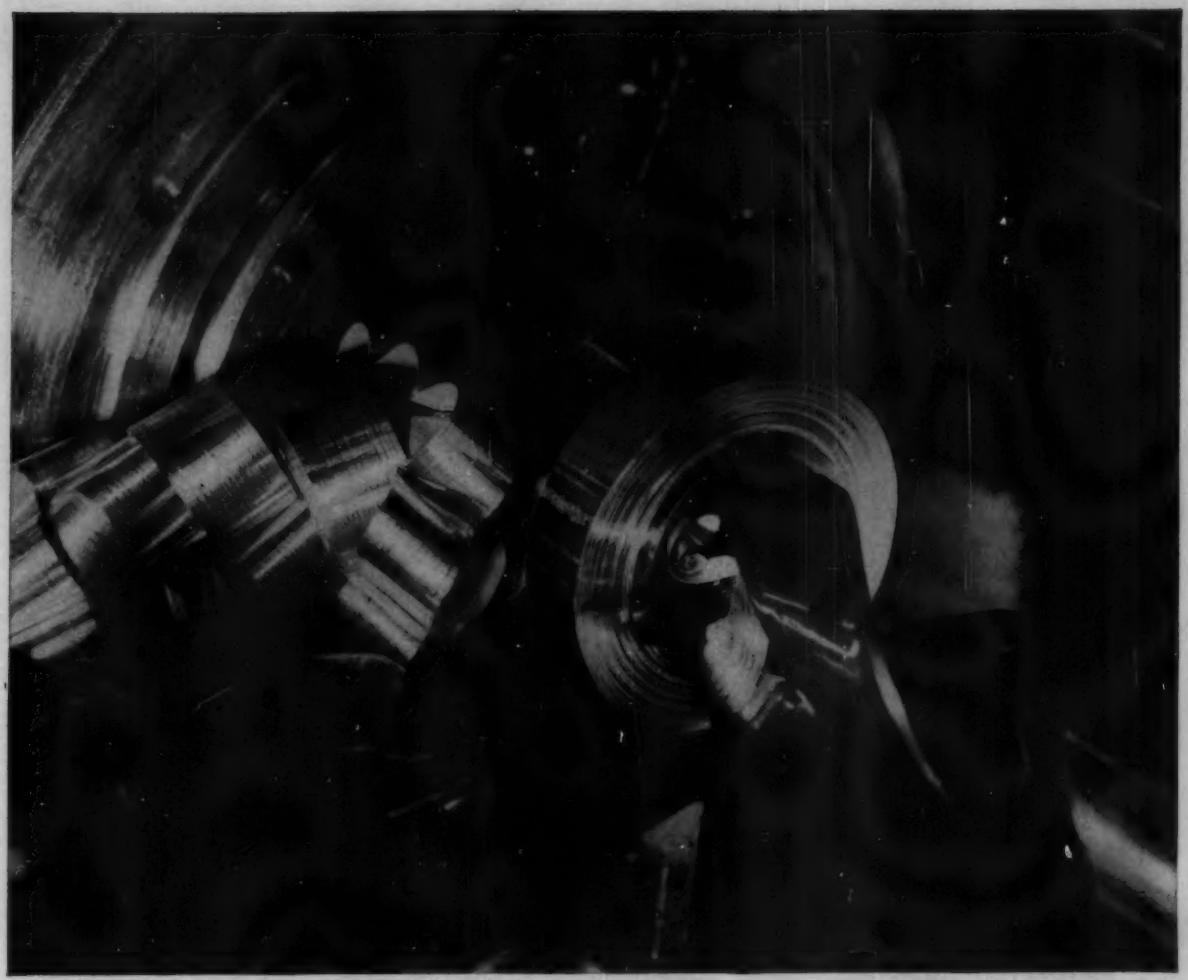
Manufacturers of precision surface grinders for production and toolroom needs

REID PRECISION SURFACE GRINDERS

REID BROTHERS COMPANY, INC. / 133B ELLIOTT ST. / BEVERLY, MASSACHUSETTS



Make "impossible" machining jobs easy ...with ALCOA ALLOY 6061!

• Tops in corrosion resistance!
• Superior finishing characteristics!
• Easily joined by soldering, brazing, welding!

Alcoa 6061-T6 or -T651 is the most versatile of all the aluminum standard screw machine stock alloys. This alloy is best for applications requiring joining, brazing, welding or soldering. And 6061 defies corrosion! The most highly finishable of the aluminum alloys, it is especially receptive to color anodizing.

When you use Alcoa® Aluminum Screw Machine Stock Alloy 6061-T6 or -T651, a complete package of data and on-the-spot service is available to you . . . when and where you need it! And for those other "impossible" machining jobs, look to Alcoa 2011-T3 or -T8, 2017-T4 or -T451 and 2024-T4 or -T351.

Ask your Alcoa distributor or call your nearest Alcoa sales office for more information. Get your free copy of the *Alcoa Screw Machine Stock Estimating and Operating Data Book* . . . provides complete information at your finger tips . . . helps make the toughest machining job a cinch. Ask, too, for a free copy of the handy *Alcoa Conversion Calculator* slide-rule device that quickly computes costs, shows savings in making a switch from brass to aluminum. Aluminum Company of America, 843-H Alcoa Bldg., Pittsburgh 19, Pa.

"PLUS" bonuses — when you use Alcoa Aluminum Screw Machine Stock!

1. Wide range of stock sizes.
2. Guaranteed market for up to 60 per cent of your Alcoa Aluminum turnings and borings.
3. Extensive mill and distributor inventories to cover all requirements.
4. Chamfered ends . . . at no extra cost.
5. Specific 12-ft lengths . . . at no extra cost (rounds up to 2¾ in.; hexagons up to 2 in.).

ALCOA ALUMINUM

SCREW MACHINE STOCK

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and "Alcoa Theatre" alternate Mondays, NBC-TV

with this NEW Cadillac Bore Set PLA-CHEK®

You can set:

DIAL BORE GAGES
INSIDE MICROMETERS
TELESCOPING GAGES
INTERNAL CYLINDER GAGES

. . . much faster than you can read this page!

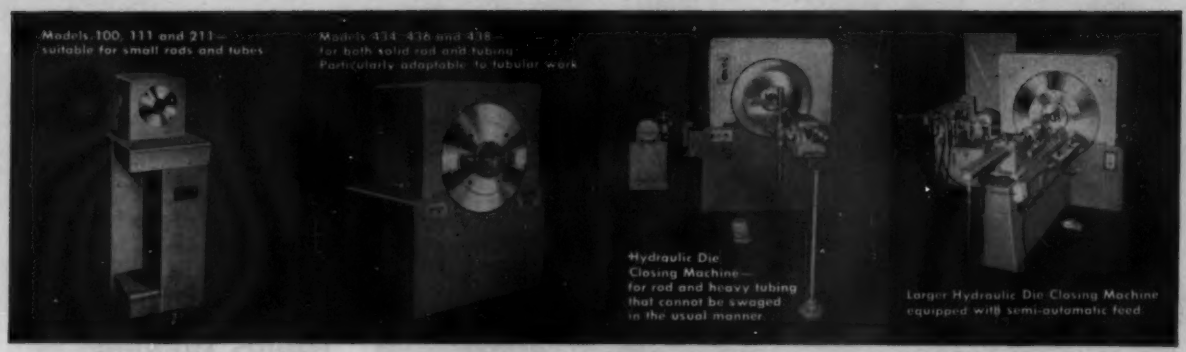
It's true! Time-saving is one of the big features of this new Cadillac Bore Set PLA-CHEK. Guaranteed accuracy is another! Designed especially to save time, money and to provide extreme accuracy in the setting and checking of Dial Bore Gages, Inside Micrometers, Telescoping Gages and Internal Cylinder Gages, this new PLA-CHEK is guaranteed to .000050". No gage blocks need be used and, in most cases, ring gage setting masters are not necessary. This new PLA-CHEK is the result of over 16 years' experience in the building of high-precision PLA-CHEK Gages. It is designed for easy portability on the job so that it may be used either on the surface plate or at the machine. Write, wire or telephone TODAY for prices and additional information.

Use it as a regular PLA-CHEK, too!

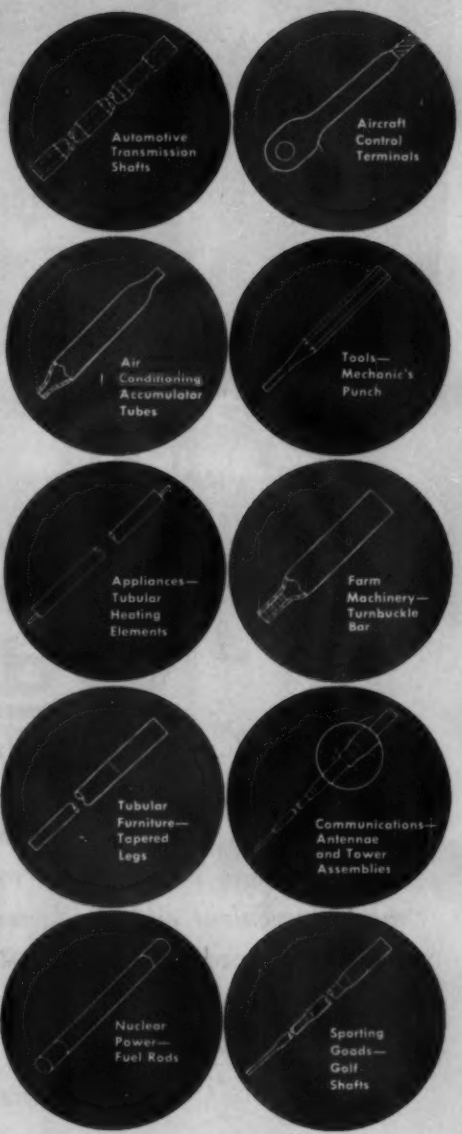
You get a bonus in value with the new Cadillac Bore Set PLA-CHEK. It is also a regular 12" self-contained PLA-CHEK Gage for use on all checking and measuring jobs where extreme accuracy is important and where speed is essential. The Bore Gage Set Rest assembly may be removed in a few seconds and used as a separate measuring gage. Other PLA-CHEKS include the 6", 12", 18", 24", 30" and 40" models.

Cadillac GAGE COMPANY

P. O. BOX 3806 • DETROIT 5, MICHIGAN


Models 100, 111 and 211—
suitable for small rods and tubes
Models 434, 436 and 438—
for both solid rod and tubing
Particularly adaptable to tubular work
Hydraulic Die
Closing Machine—
for rod and heavy tubing
that cannot be swaged
in the usual manner
Larger Hydraulic Die Closing Machine
equipped with semi-automatic feed

TORRINGTON ROTARY SWAGING MACHINES DO JOBS LIKE THIS FASTER AT LOWER COST



Swaging is not only the fastest but also the most economical way to point, taper, reduce, size or bond thousands of small metal parts. You save on time, labor and materials—no stock is wasted. Tooling is simple and inexpensive.

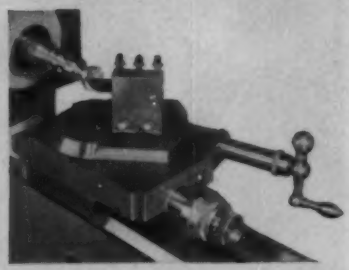
Consider the variety of swaged metal parts illustrated here. If you are producing such parts by other means, you are probably paying too much for them — and not getting the improved metal grain structure and surface hardness and finish that swaging provides.

Torrington is the top authority on swaging. We originated the process and designed the original equipment. We offer you more swaging experience than any other company in the world. If a part can be swaged, we have the skill and knowledge to produce the dies to swage it. We maintain experimental shops especially to work out your problems. For full information, call in The Torrington Company, Swaging Machine Division, 200 North Street, Torrington, Conn.

progress through precision **ROTARY SWAGING MACHINES**

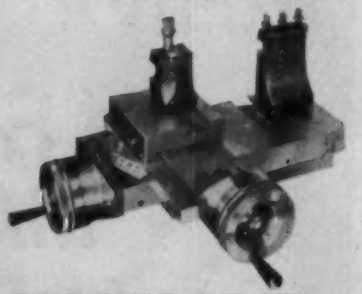
THE TORRINGTON COMPANY Torrington, Conn.

SOME OF THE MANY
COST-SAVING FEATURES



RADIUS TURNING ATTACHMENT

Concave and convex surfaces are readily generated after a simple set-up with a direct-reading dial indicator. Worm gear feeding insures a finely controlled finish.



REAR SLIDE CUT-OFF

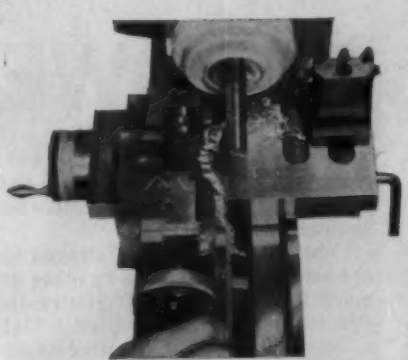
The rear tool station is an added feature to the traditional convenience and accuracy of the Wade Super Slide Rest. A cut-off tool may be left in readiness to avoid tool changing.

Cut toolmaking costs with a Wade *#94 FINISHING LATHE*

Every design feature built into the Wade Finishing Lathe has one aim in view: to make this machine the *most convenient and the fastest to use* for toolmaking and limited production. The Wade Model #94 has a 9″ swing, 1-1/16″ collet capacity and will accept 15″ between centers.

Write for literature.

Sold by Pratt and Whitney Co., Inc. in most areas.



DIRECT READING DIALS

Large satin-chrome dials read directly in thousandths of an inch and are resettable to zero.

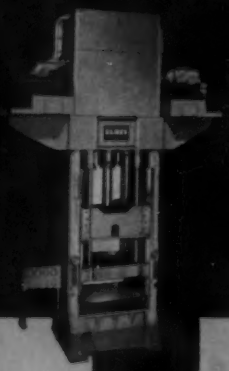
THE WADE TOOL CO.
WALTHAM 54, MASS., U.S.A.

MAKERS OF
PRECISION MACHINE TOOLS
FOR AMERICAN INDUSTRY

At CHICAGO (or anywhere) . . .
When you look at the
BETTER MACHINE TOOLS
you will see

KING

VERTICAL BORING AND TURNING MACHINES



ELMES

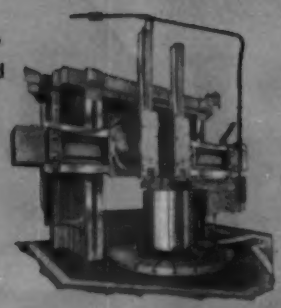
HYDRAULIC PRESSES AND EQUIPMENT

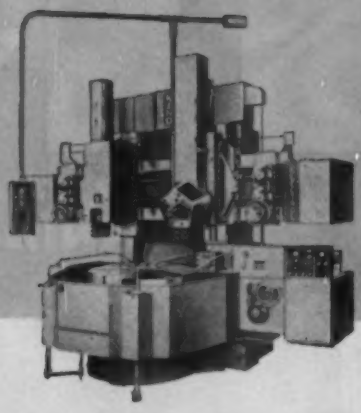
for Metalworking, Plastics Molding, Custom-designed Applications.

American Steel Foundries **ELMES KING DIVISION,** Cincinnati 29, Ohio

KING

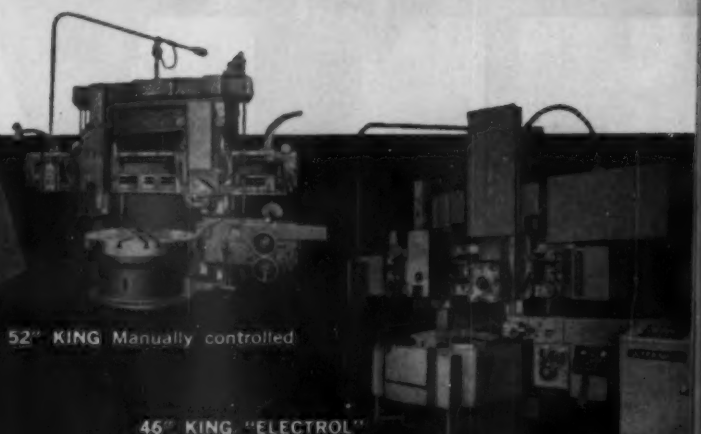
120" KING "ELECTROL"
Full Electrically controlled





56" KING "ELECTROL"
Full Electrically controlled

...the BETTER MACHINE

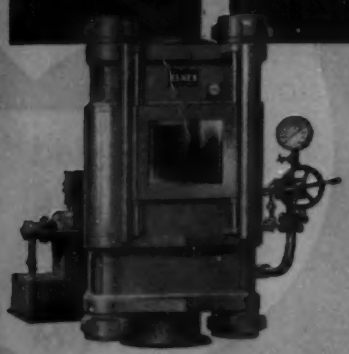


52" KING Manually controlled

46" KING "ELECTROL"
with "Ultramatic" automatic cycling

ASF American Steel Foundries

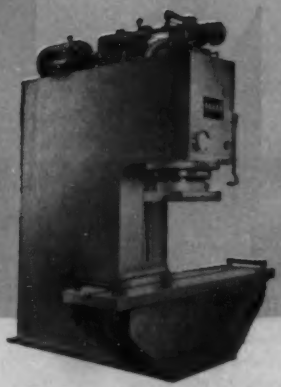
ELMES



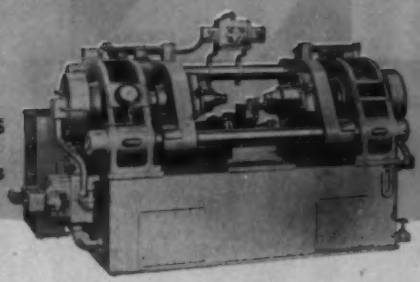
1000-ton ELMES
Hobbing Press

100-ton ELMES
C-Frame Press

400-ton ELMES
Bulldozer Press



200-ton ELMES
C-Frame Press

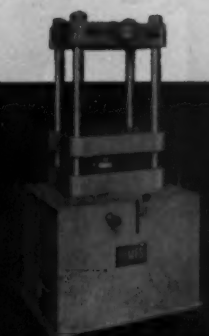


250-ton ELMES
Track Link
Assembly Press

TOOLS you will see at BOOTH 1406!

30-ton HYDROLAIR*

50-ton HYDROLAIR*



75-ton HYDROLAIR*

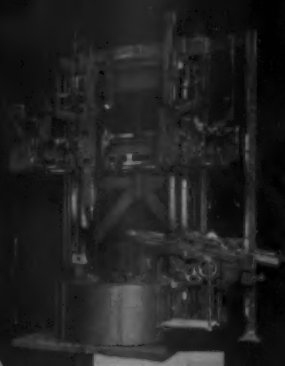
100-ton HYDROLAIR*

*ELMES "HYDROLAIR" is an air-powered full oil-hydraulic press.

ELMES/KING DIVISION, *Cincinnati 29, Ohio*

MODERN MACHINE TOOLS
MMT-PE
PRODUCTION EFFICIENCY

CUSTOM Designs...
in addition to complete
STANDARD lines...



Special 72" KING with extended height under rail, tracer controlled turning and grinding, angular mounted side head rams, and console controls.

KING

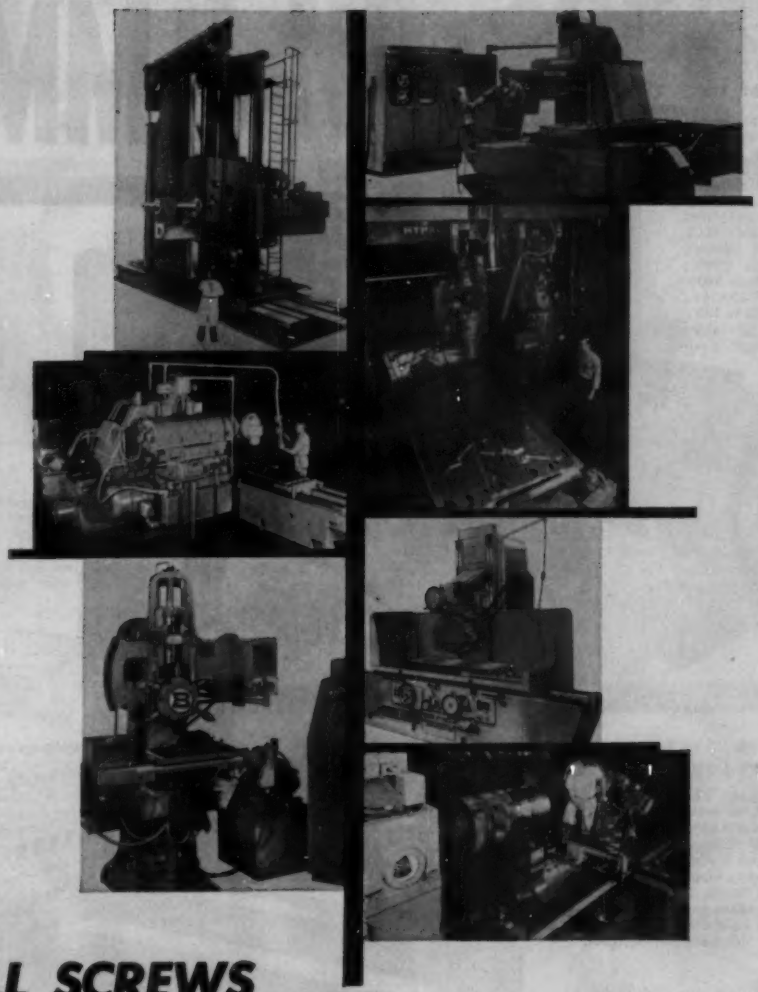
Specially designed ELMES 400-ton Traveling Head Straightening Press handles a wide variety of sizes and shapes of castings for builder of heavy construction machinery.

ELMES

KING *Vertical Boring and Turning Machines*
ELMES *Hydraulic Presses and Equipment*

American Steel Foundries **ELMES/KING DIVISION,** Cincinnati 29, Ohio

Without a doubt there will be more **Beaver** ball screws than any other make on machine tools being demonstrated at the M.T.B.A. show in Chicago next month

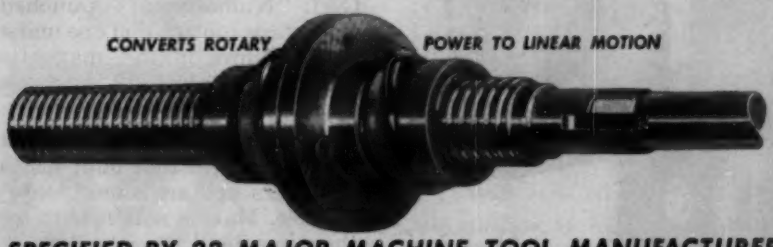


BEAVER BALL SCREWS

Part of the Secret of Their High Precision!

Tolerances close as .001" maximum error in 10 feet of ball nut travel are not uncommon in Beaver Ball Screws. Spring rates in excess of 20 million pounds per inch are not exceptional. They're specified where system stiffness that permits accurate locating and repeatability, free from backlash and surge, is essential. 90% (plus) efficiency with consequent low power requirements, compactness and reliability are inherent Beaver characteristics. That's why they are used in actuating vital aircraft parts and head slides and tables of precision machine tools as well as critical functions in other capital equipment.

Beaver Ball Screws provide for the moving of massive loads or extreme small parts such as fuel metering devices with equal sensitivity. Our engineers will be glad to consult with you in determining where they may serve better than hydraulic, pneumatic or acme screw actuation in your product. Write for our catalog.



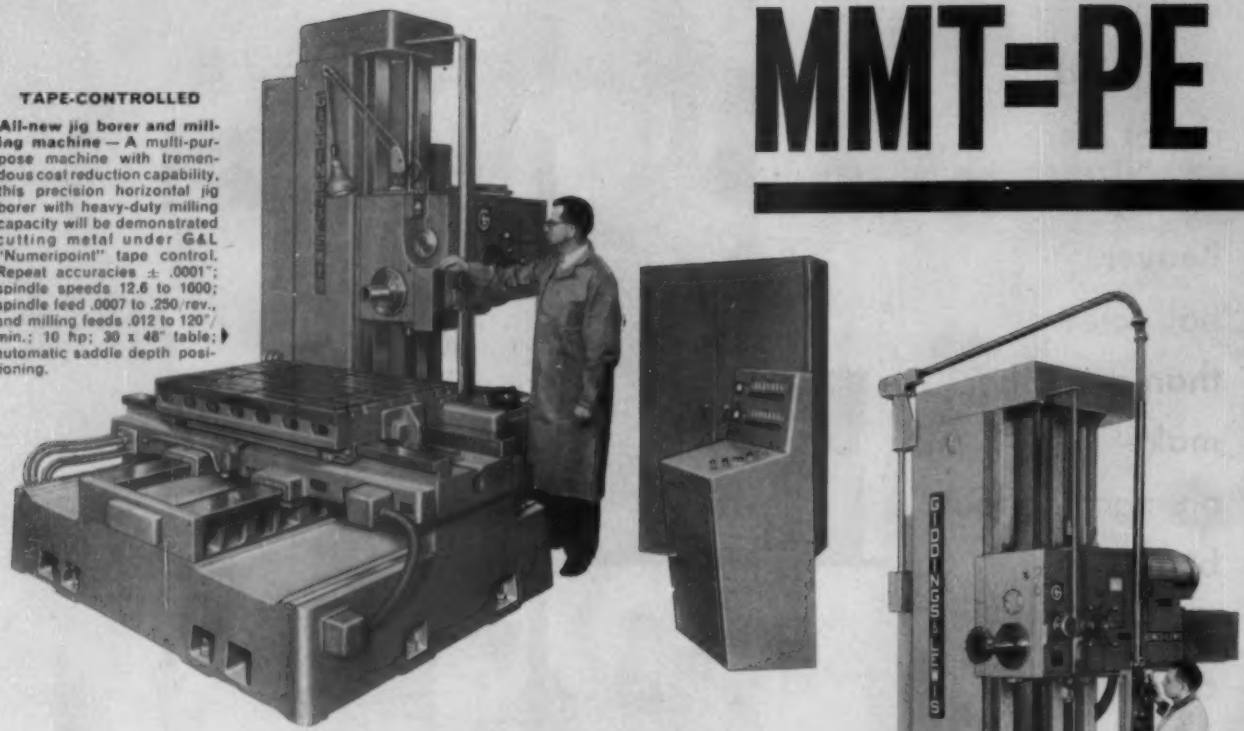
SPECIFIED BY 22 MAJOR MACHINE TOOL MANUFACTURERS

Beaver Precision Products INC.
Largest manufacturers of precision ball screws
CLAWSON, MICH.

MMT=PE

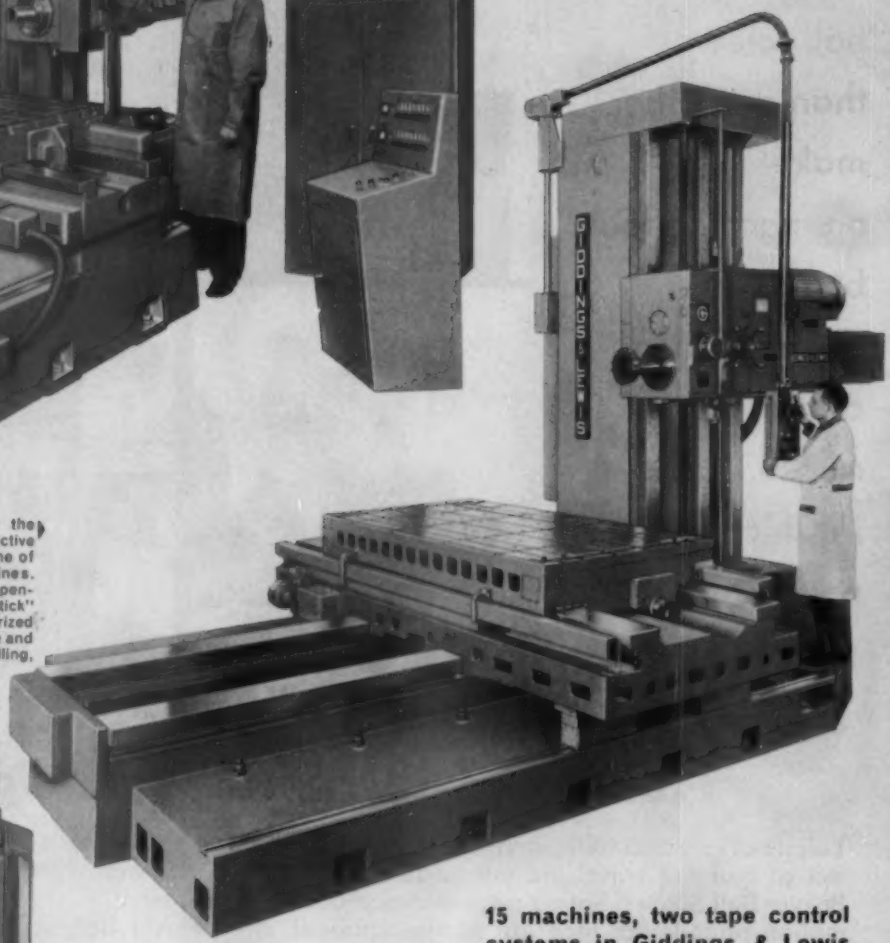
TAPE-CONTROLLED

All-new jig borer and milling machine — A multi-purpose machine with tremendous cost reduction capability, this precision horizontal jig borer with heavy-duty milling capacity will be demonstrated cutting metal under G&L "Numeripoint" tape control. Repeat accuracies ± .0001"; spindle speeds 12.6 to 1600; spindle feed .0007 to .250 rev., and milling feeds .012 to 120"/min.; 10 hp; 30 x 48" table; automatic saddle depth positioning.



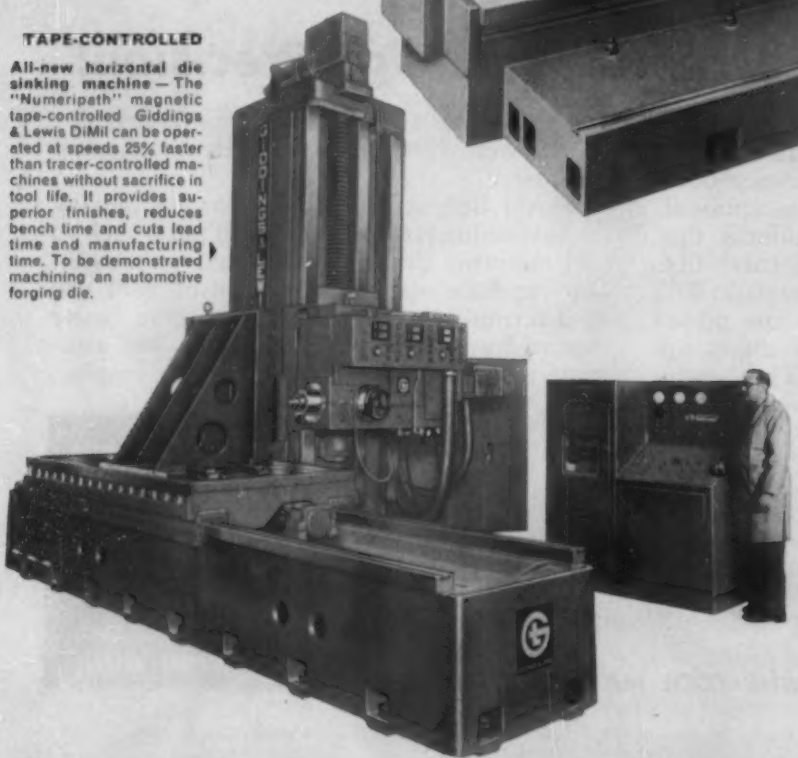
TAPE-CONTROLLED

All-new table-type horizontal built with the power and rigidity to make it the most productive machine in the history of the world's leading line of horizontal boring, drilling, and milling machines. Dozens of advanced features include complete pendant control of every machine function, "joy-stick" control of milling feeds, 3-way column, motorized headstock, independent and combination saddle and spindle feeds. To be demonstrated boring, drilling, and milling under "Numeripoint" control.



TAPE-CONTROLLED

All-new horizontal die sinking machine — The "Numeripath" magnetic tape-controlled Giddings & Lewis DiMil can be operated at speeds 25% faster than tracer-controlled machines without sacrifice in tool life. It provides superior finishes, reduces bench time and cuts lead time and manufacturing time. To be demonstrated machining an automotive forging die.



15 machines, two tape control systems in Giddings & Lewis $1,000,000 display

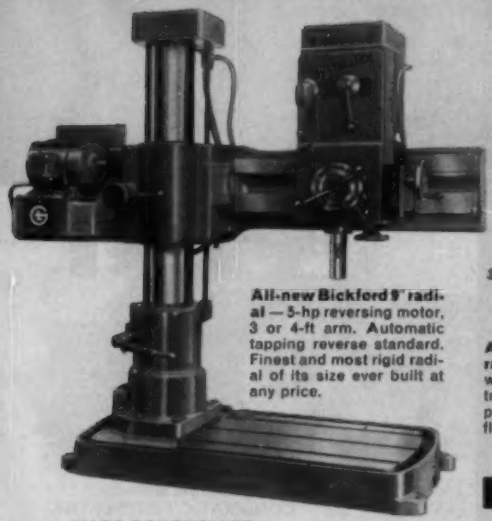
15 advanced design machine tools with a total worth of more than $1,000,000 will be exhibited by Giddings & Lewis at the Machine Tool Exposition. All machines will be under power, five operated by G&L "Numeripoint" punched paper tape control, and one under G&L "Numeripath" magnetic tape path control. 12 machines will be cutting metal.

The capabilities of this equipment as compared to that built just a few years ago are almost unbelievable. Make a note now to see them in action!

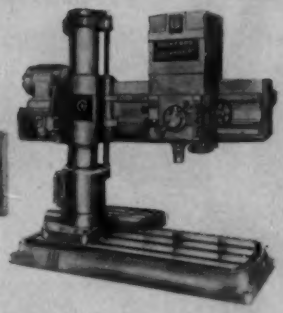
Ad No. GL-100

"Numeripoint," "Numeripath," and "DiMil" are Giddings & Lewis trade-marks.

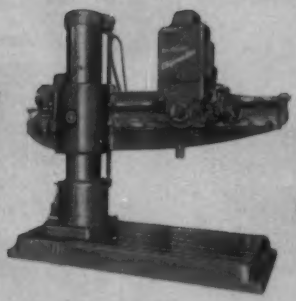
AT BOOTH NO. 1320!



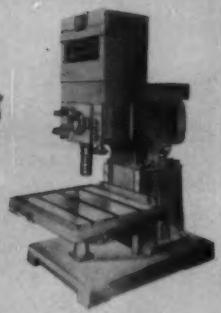
All-new Bickford 9" radial — 5-hp reversing motor, 3 or 4-ft arm. Automatic tapping reverse standard. Finest and most rigid radial of its size ever built at any price.



All-new 10-hp 11" Bickford radial — New heavy-duty head with pushbutton spindle control enables the operator to put more finished parts on floor.



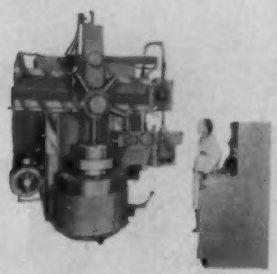
Heavy-duty 15" and 19" Bickford radials — The exclusive capabilities of these machines will be demonstrated by tapping Class 3 threads, drilling 3" holes at .100" feed/rpm!



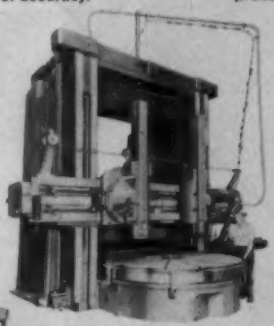
All-new Bickford 38" upright drill —This versatile 10-hp machine is a totally new concept in fast precision equipment for production and layout drilling. Features pushbutton operation.

TAPE-CONTROLLED

42" vertical turret lathe — An original G&L development that brings revolutionary economies to automatic small-lot machining. Table speeds, feeds, the five tools in turret head and four in side head are positioned by tape.



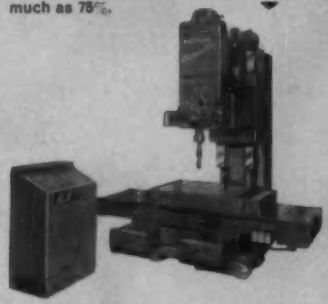
8-ft heavy-duty vertical boring mill— with full pendant control, roller bearing table track, and electronic readout measuring system. Operates continuously at carbide and ceramic tool speeds without loss of accuracy.



New 28" Bickford automatic cycling drill — A wide range of speeds and feeds in combination with automatic cycling and pushbutton control make this machine an outstanding producer on small lots or long runs.

TAPE-CONTROLLED

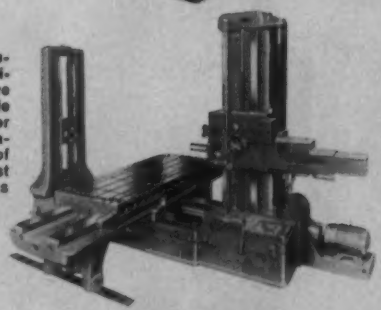
New high-speed positioning table and precision drilling machine — 360"/min 38" x 50" table with 5-ton capacity positions to ± .001", repeats to ± .0005". Drill features full preselection of 36 speeds, 18 feeds. Reduces floor-to-floor time as much as 75%.



TAPE-CONTROLLED

Precision production-type 5" floor-type horizontal with auxiliary table — Every feature for fast positioning, repeating accuracy, versatility of application in boring, drilling, tapping, milling. Manual, digital dial and tape control.

A new simplified manufacturing-type 4" horizontal featuring exclusive new zero positioning scale and many other items for operating ease and versatility that make it one of the fastest and easiest machines to run that has ever been built.



GIDDINGS & LEWIS

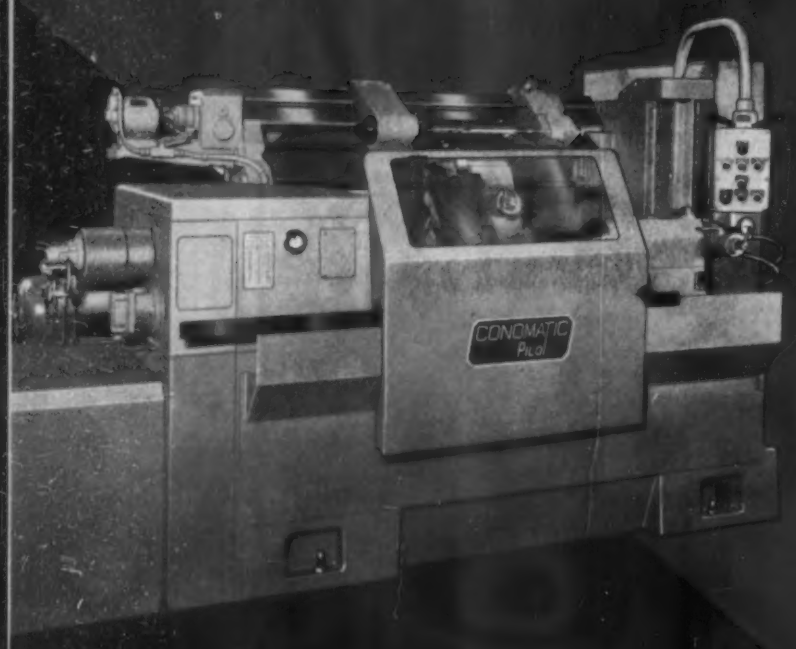
GIDDINGS & LEWIS MACHINE TOOL COMPANY, Fond du Lac, Wis.

Jig borer and milling machines; horizontal boring, drilling, and milling machines; vertical turret lathes; vertical boring mills; positioning tables; die sinking machines; contour milling machines; radial and upright drilling machines; planers; planer mills; numerical and tracer control systems; Davis boring tools.

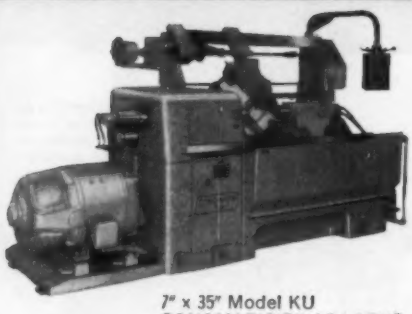
◀ CIRCLE 605 READER SERVICE CARD

CIRCLE 606 READER SERVICE CARD

A CORDIAL



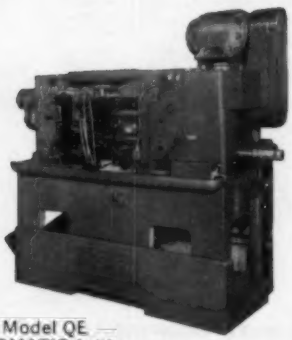
The CONOMATIC PILOT
10″ x 35″ Model KU
An economical, efficient, fully automatic copying lathe. Produces a variety of work with great accuracy and exceptionally good finish.



7″ x 35″ Model KU
CONOMATIC PILOT LATHE

See these TWO at CHICAGO!

...see all EIGHT



9/16″ Model QE
CONOMATIC (with Magazine Feed)

The Model QF 9/16″
6-Spindle BAR CONOMATIC
Designed to give better accommodation, support and maintenance to tools and work up to 9/16″ dia.

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

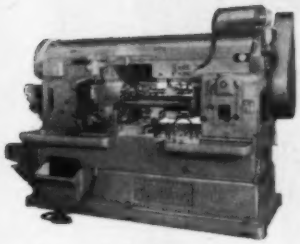
BOOTH NO. 1215

CIRCLE 107 READER SERVICE CARD

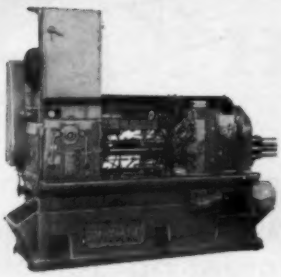
INVITATION FROM CONE AUTOMATIC...

You will be most warmly welcome at the CONE Booth, No. 1218, NMTBA Exposition, Chicago Amphitheatre, September 5-16. Here you will see thoroughly demonstrated the profitable production features of two outstanding CONOMATICS.

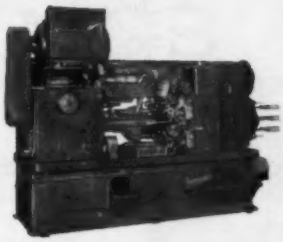
Although these machines excel in the ranges of work for which they are designed, they are only a token representation of the quality and depth of machining service provided by the entire CONOMATIC line.



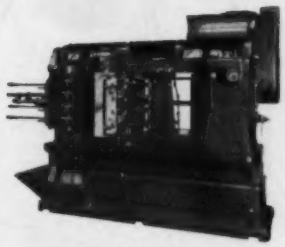
5⅞" Model TE
CONOMATIC



1" Model TS Bar
CONOMATIC



1⅛" Model TF Bar
CONOMATIC



1½" Model DP 4-HI Bar
CONOMATIC

CONOMATICS in action at the permanent display at WINDSOR

The home of CONE AUTOMATIC MACHINE CO., INC., at Windsor, Vermont

For those whose interests require more deliberation for machine analysis and comparison than the convention's busy equipment show permit, Cone — at its Windsor, Vermont plant — has prepared a permanent display of CONOMATIC exhibit that more completely presents all of the top features of the "World's Most Productive Line of Automatics". Here you may see in action the capabilities of a single model, or a group of models, and privately examine them in the light of your own specific requirements.

Cone will be delighted to supply travel information, and arrange for comfortable accommodations.

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
Windsor, Vermont

Hydraulic presses should work smoothly, with no jerk or erratic action. But sludge and varnish in an Eastern plant's presses caused uneven operation, with increasing "rejects."

A Sinclair lubrication engineer recommended Sinclair's new DURO hydraulic oils with oxidation, rust and foam inhibitors. Result: outstanding performance, with "rejects" cut to minimum.

Let Sinclair tackle (and solve) your plant problems. Call your local representative or write...

Sinclair

SINCLAIR REFINING COMPANY

TECHNICAL SERVICE DIVISION • 600 FIFTH AVE., NEW YORK 20, N.Y.

NEW!

THE SHAPE OF THINGS TO COME

Model 624 Automatic Face Mill Grinder

Model 600 Drill Grinder with Manual or Automatic Infeed

A visit to Oliver's Booth 342 at the Machine Tool Exposition will reveal how your tool and cutter grinding practices can be made more compatible with modern production machining requirements.

Eleven Oliver machines under power will be demonstrated for you. Four of these are grinders which have not been exhibited before. Thus, you will have an initial opportunity to view "The Shape of Things to Come."

Oliver specialists will be pleased to show you the fastest and most accurate grinding method available today for sharpening drills, reamers, single point tools, hobs, spot facers, milling cutters, face mills, end mills, counterbores, routers, circular metal or wood saws, or similar tools.

OLIVER of ADRIAN

1414 E. Maumee St. • Adrian, Michigan

DRILL GRINDERS AND THINNERS

TOOL AND CUTTER GRINDERS

AUTOMATIC AND MANUAL FACE MILL GRINDERS

TOOL BIT GRINDERS

CONTOUR SAWING AND FILING MACHINES

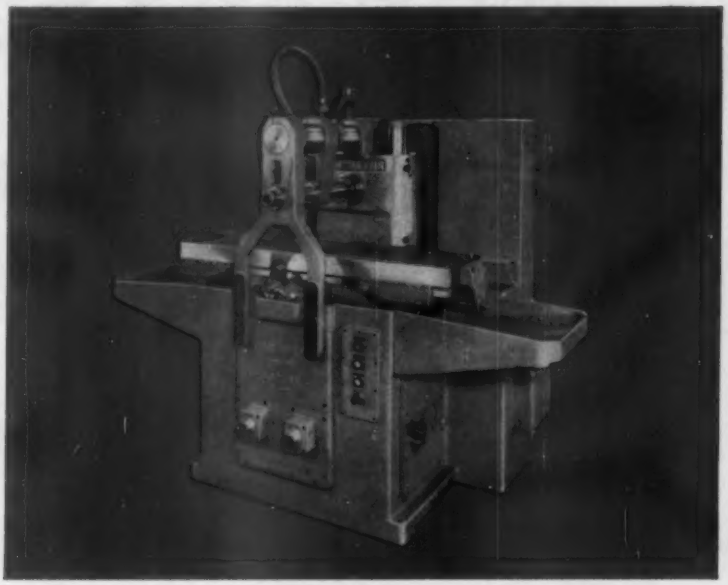
Call on

KENT-

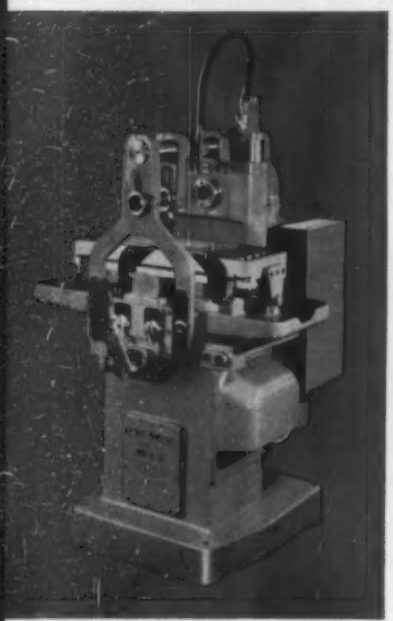
see rugged cost-saving

. . . consult with us about

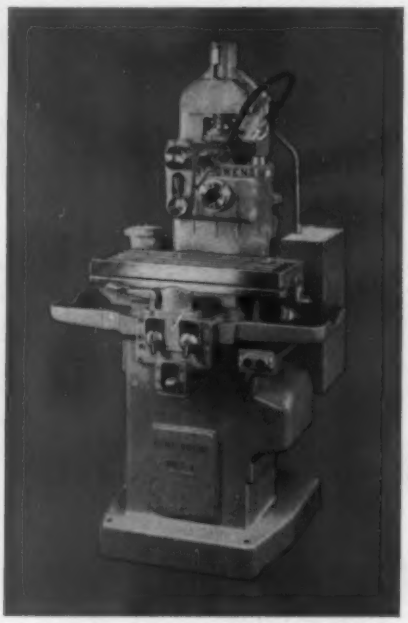
No. 1-14 . . . 14″ table travel . . . 32″ x 9″ table . . . full automatic hydraulic table feed.



No. 2-24 . . . 24″ table travel . . . 48″ x 12″ table . . . full automatic hydraulic table feed.



No. 1-8 . . . 8″ table travel . . . 25″ x 9″ table . . . semi-automatic hydraulic table feed.



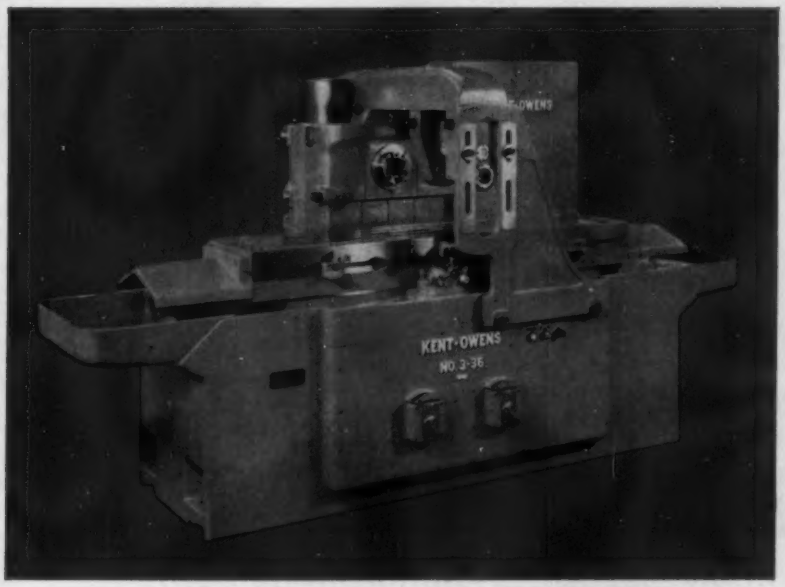
No. 1-V . . . Hydraulic vertical head feed . . . 5½″ head travel . . . 25″ x 9″ table.

No. 1-M . . . Hand feed to table and head . . . 25″ x 9″ table . . . Adjustable head counter-balance.

-OWENS at the show

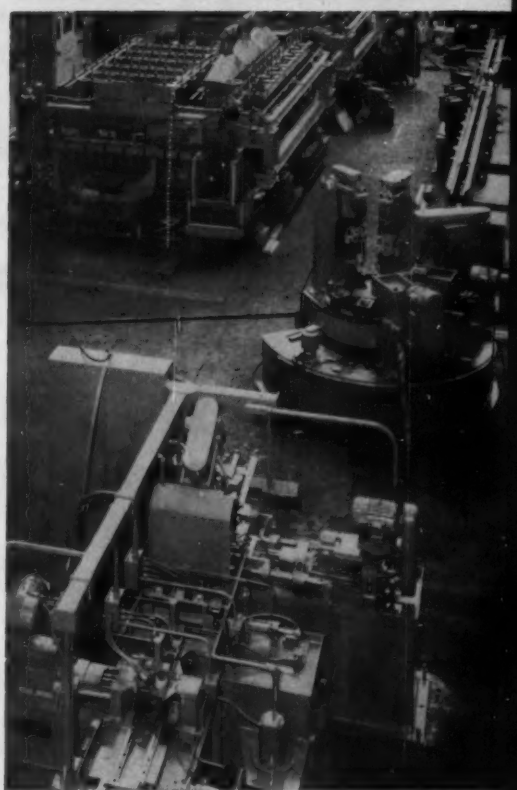
Milling Machines *in operation*

Special Machinery and Automation Equipment



No. 3-36 . . . 36″ table travel . . . 64″ x 16″ table . . . full automatic hydraulic table feed.

BOOTH 547



A section of our assembly floor showing Automation-Type Machines in process of manufacture.

Idea-hunting for ways to trim costs and improve production? Visit Kent-Owens Booth 547 at the Machine Tool Exposition in Chicago!

Here you will see Kent-Owens Mills *in action* on a variety of work. You'll see how Kent-Owens design pays off in fast cutting action combined with easy convenient operation. One of our Engineers will be glad to discuss methods, tooling and proper machine to help solve your particular milling problem. We design and build all types of tooling for use on Kent-Owens Mills.

You may also wish to talk with us about designing and building *Special Machinery and Automation Equipment.* With our Engineering know-how and many years' experience in this field, we may have the answer to your problem. Another service we offer is Contract Machine Building (customer designed equipment). We will be pleased to quote on your requirements. See us at the Show . . . write or call . . . Kent-Owens Machine Co., Toledo 10, Ohio.

KENT-OWENS

Designers and Builders of MILLING MACHINES and SPECIAL MACHINERY

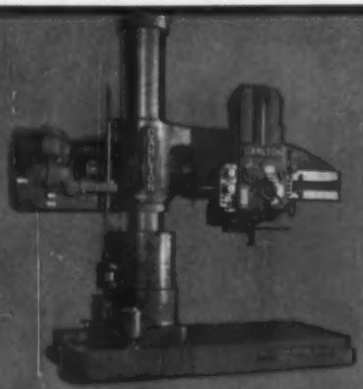
CIRCLE 612 READER SERVICE CARD

Carlton

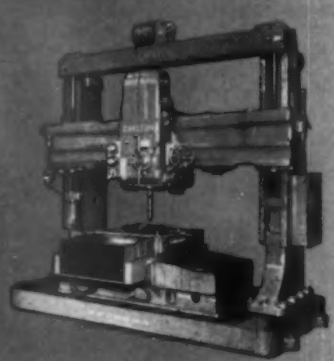
NEW PLANER TYPE BORING AND DRILLING MACHINE with numerically controlled automatic positioning. Accurately locates work for boring, reaming, drilling, tapping.

HORIZONTAL DRILLS now with numerical control . . . for tape, keyboard or pushbutton control. Allows any shop to automate boring, drilling, reaming, tapping.

See these new Carlton machines at the machine tool show



RADIAL DRILLS. The best known, most highly respected and widely used radial drills. Made in column diameters from 9" to 26", arm lengths from 7-ft. to 12-ft.

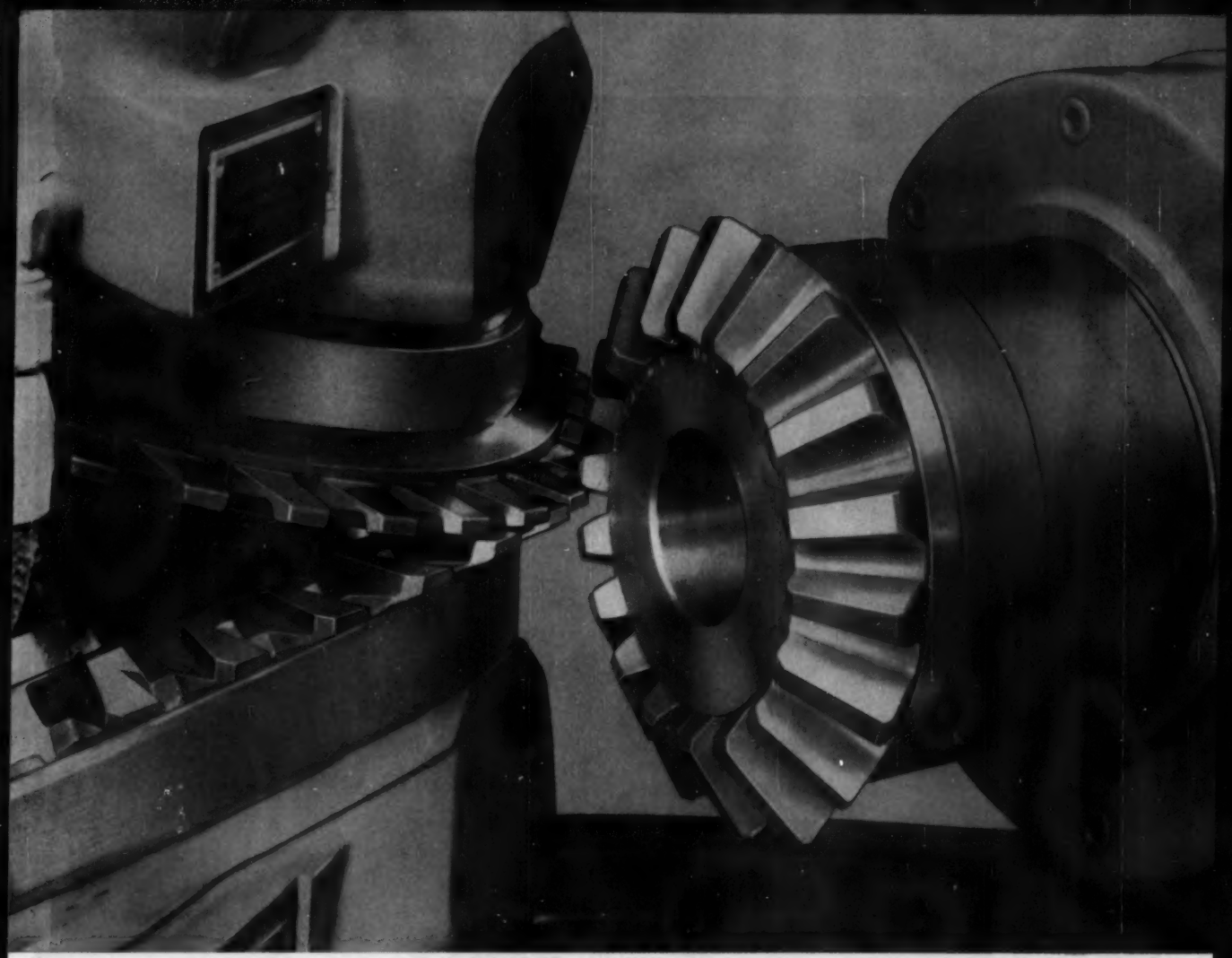


NEW VERTICAL DRILLING MACHINE with automatic positioning (or spacing) table. Introduces jigless heavy duty boring and drilling, puts it on a production basis for the first time.

NOW: NUMERICAL CONTROL by Carlton Controls Corp. for Carlton 4H and 5H horizontal drills and for Model ARS planer type boring and drilling machine. Write for complete information.

MMT-PE VISIT CARLTON BOOTH 849

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO / *Specialists in boring and drilling machines since 1916*



How to complete gears up to 16" O.D. in one cut from the solid

The Gleason No. 114 Straight Bevel Coniflex® Generator cuts gears directly from the solid in diameters up to 16", up to 2½" face width and 2½ diametral pitch.

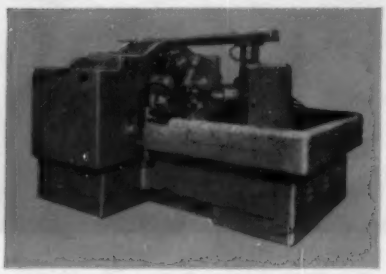
With it you obtain much faster production rates—up to five times faster than with other methods. Still it retains a basic flexibility which permits quick changeovers from one job to another.

Excellent quality. Even with the speed of the No. 114 Coniflex Generator, quality remains excellent. It provides a smooth blend of root, fillet, and tooth flank—your assurance of strong, accurate teeth.

Coniflex gears give localized tooth bearing, too, assuring practical assembly tolerances.

Simplified calculations. You can do all calculations with a slide rule. You can also control tooth bearing easily to suit various operating conditions or to set up interchangeability with existing gears.

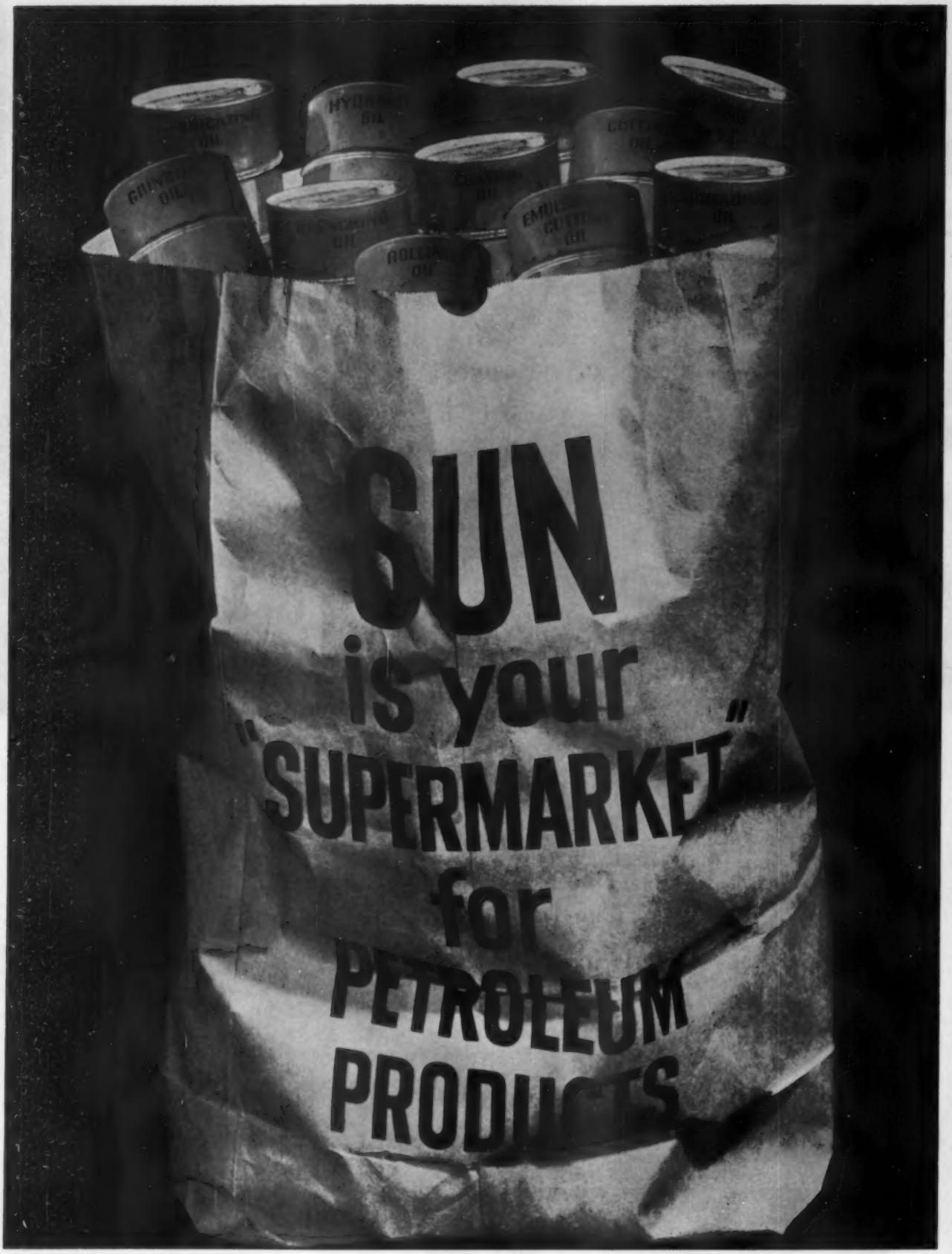
For more details on the No. 114, write for bulletin.



GLEASON WORKS

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

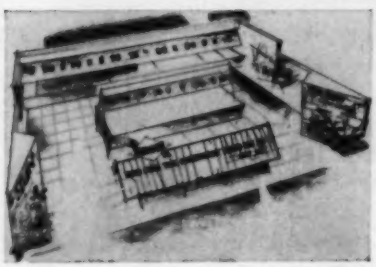
CIRCLE 614 READER SERVICE CARD


SUN
is your
"SUPERMARKET"
for
PETROLEUM

Does it make sense to shop around for petroleum products when you can get the best of everything from one source? Not when you can save time and money by dealing at Sun's "Supermarket," a single source of hundreds of quality petroleum products.

Your local Sun man is a human encyclopedia of technical know-how based on research and experience. He'll give you all the technical help you need.

You'll like dealing at the Sun "Supermarket"... where quality has been established as the best economy of all. Call your local Sun man, or write SUN OIL COMPANY, Philadelphia 3, Pa. In Canada: Sun Oil Company Limited, Toronto and Montreal.



Be sure to visit the Sun exhibit at the Machine Tool Builders Show in International Amphitheatre, Chicago, Illinois. Sept. 6-16. Booth 1513.

SUNOCO

ORIGINATORS OF CUSTOM-BLENDED BLUE SUNOCO GASOLINES

CIRCLE 616 READER SERVICE CARD

AT DEVLIEG BOOTH 431 • NMTBA EXPOSITION

new series

"Designated the model 'H,' our new Jigmil series provides greater range, is more rugged, easier to operate and more accurate."

"Available in spindle sizes ranging from 3" to 5", the new 3H, 4H and 5H machines greatly increase JIGMIL range for precision boring, milling, drilling and other operations. The new series introduces simplified controls, thermal control of main spindle bearings for increased accuracy . . . wider bed and table for added stability and working range . . . stainless steel way covers for positive protection . . . features that reach a new standard in JIGMIL accuracy, ruggedness and simplicity of operation. And like all JIGMILS, the 'H' series is available with the DeVlieg Diatrol direct dial dimensioning system or Tapac* —DeVlieg's own system of automatic tape control."

R. A. JERUE
Vice President in Charge of Engineering

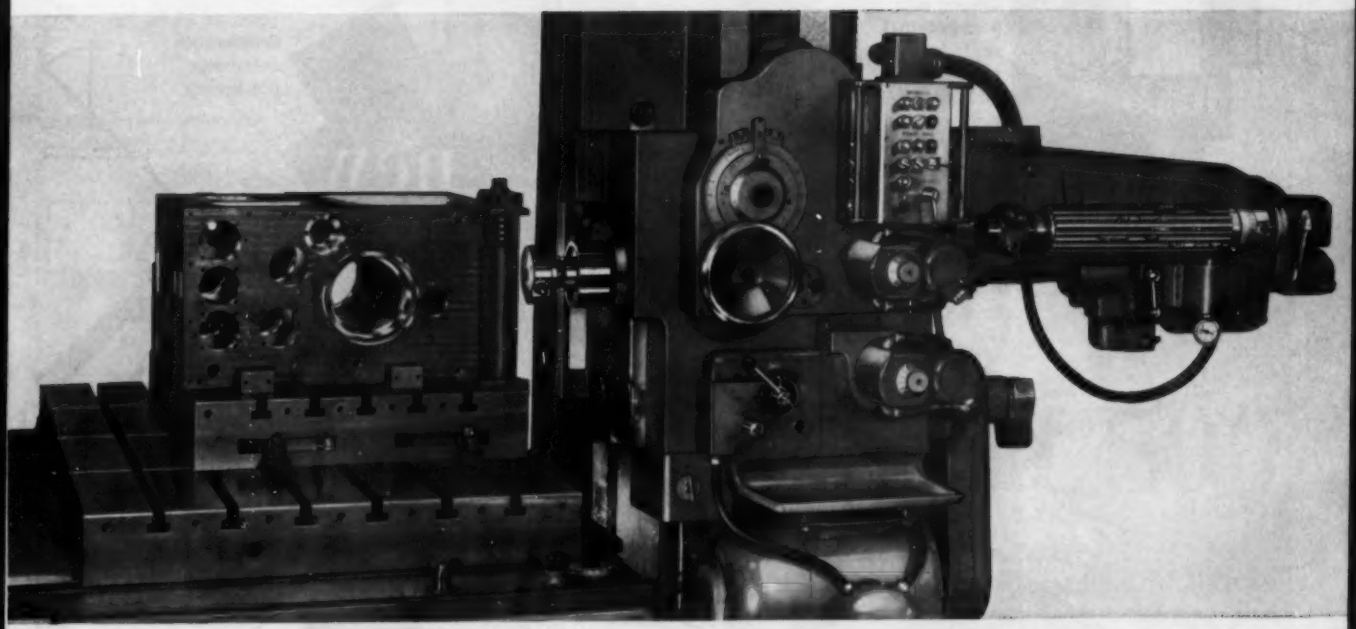
**Tape Automatic Positioning And Control*

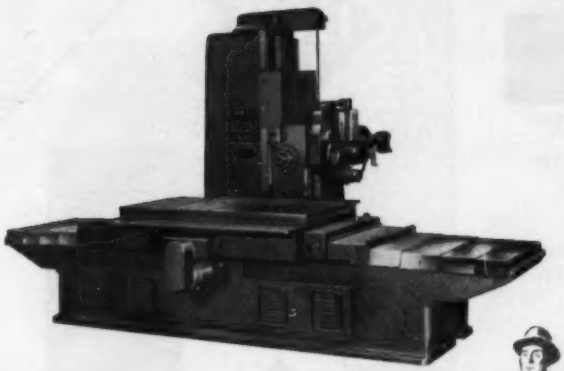
DEVLIEG MACHINE COMPANY, FAIR STREET • ROYAL OAK, MICHIGAN

CIRCLE 617 READER SERVICE CARD

"H" Jigmils®

with Duplitrol • Diatrol • Tapac





Rewarding revelations in automatic precision await your next visit to Fair Street

MMT-PE

See new "H" series JIGMILS with DeVlieg Diatrol and DeVlieg Tapac in operation at the NMTBA Exposition, Chicago, September 6-16th.

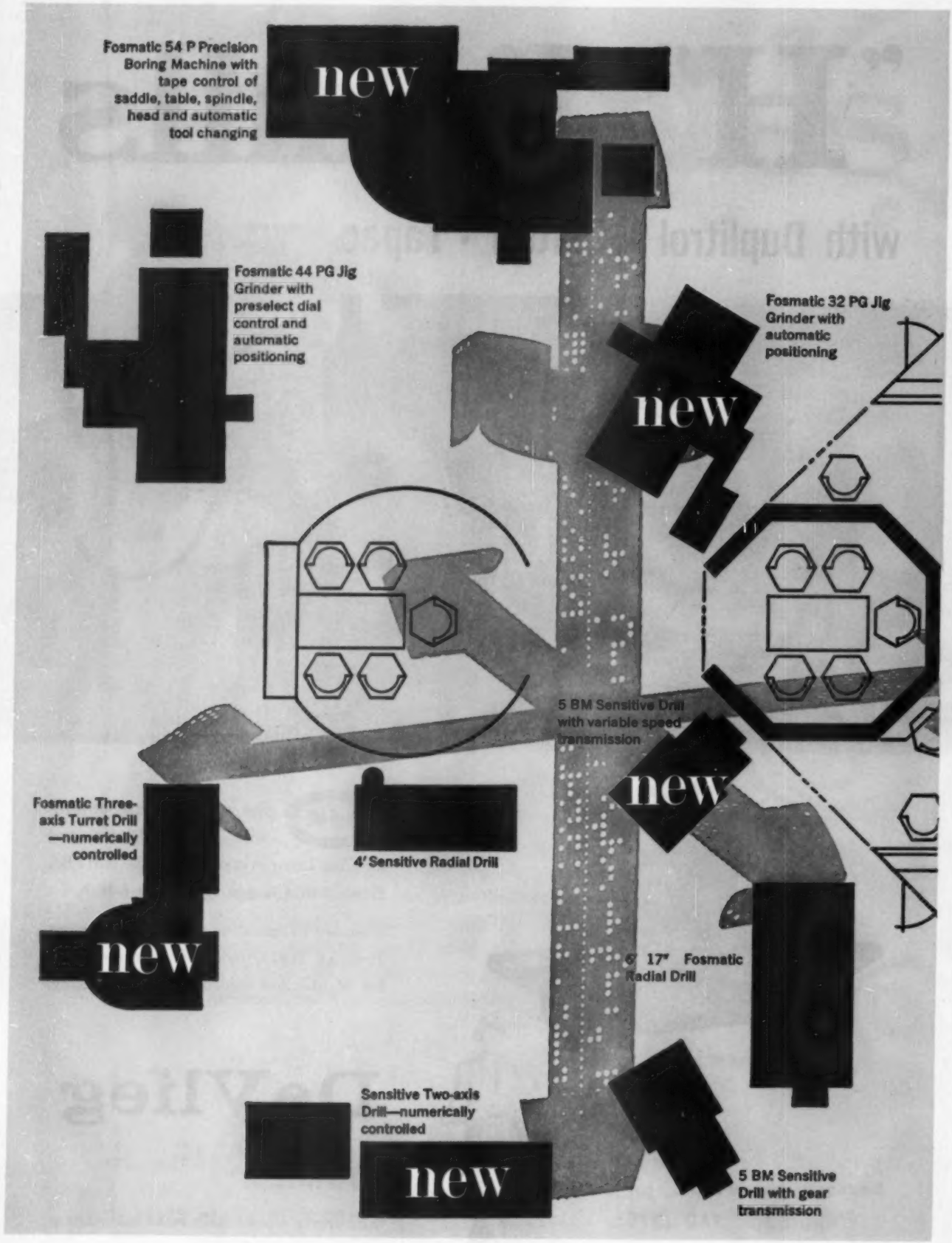
Also, see in operation the new Micropoint Precision Tool Grinder—first grinder capable of absolute control of tool geometry.

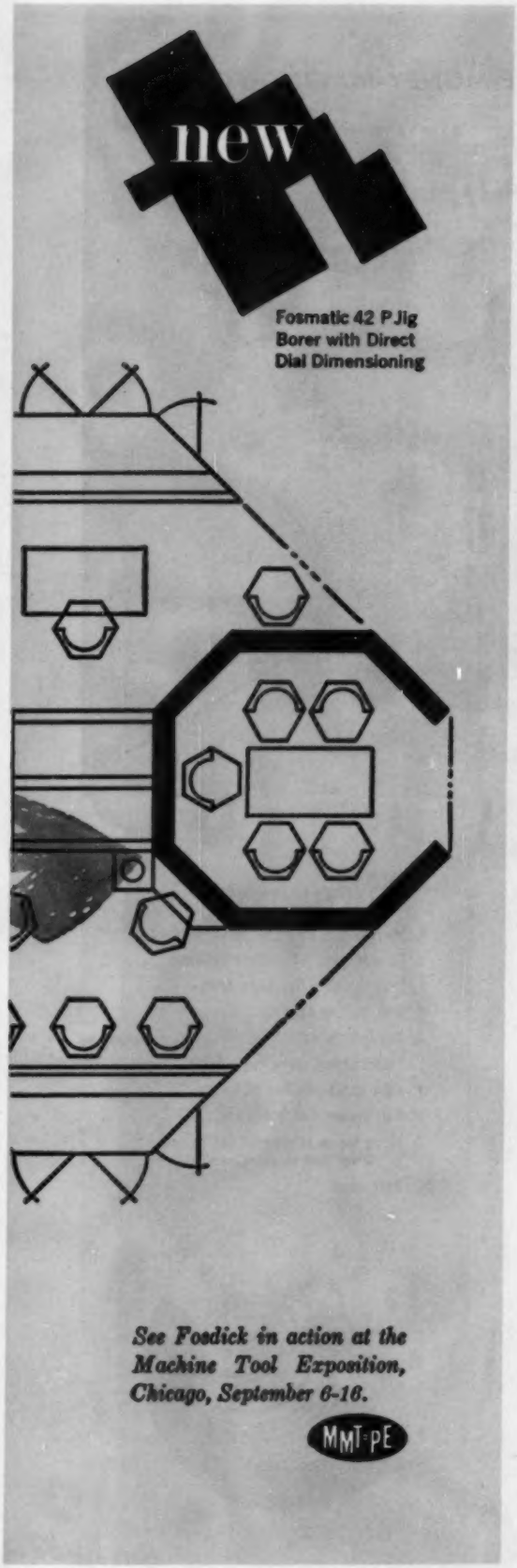
DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

CIRCLE 618 READER SERVICE CARD


Fosmatic 54 P Precision Boring Machine with tape control of saddle, table, spindle, head and automatic tool changing
new
Fosmatic 44 PG Jig Grinder with preselect dial control and automatic positioning
Fosmatic 32 PG Jig Grinder with automatic positioning
new
5 BM Sensitive Drill with variable speed transmission
new
Fosmatic Three-axis Turret Drill —numerically controlled
new
4' Sensitive Radial Drill
6' 17" Fosmatic Radial Drill
Sensitive Two-axis Drill—numerically controlled
new
5 BM Sensitive Drill with gear transmission



See Fosdick in action at the Machine Tool Exposition, Chicago, September 6-16.

MMT-PE

new at the show

new BOOTH 800

Rest your tired production worries here.

Chasing that elusive last ten-thousandth inch? Here are machines guaranteed to work to that 4th decimal place *on a production basis.* Now Fosmatic Precision Boring Machines are completely automatic, with numerically controlled saddle, table, spindle, head, and tool changer. This is NEW. See them at The Show. Booth 800.

Now famous Moore-Fosdick Jig Grinders have automatic positioning and numerical control. This is NEW. See them at The Show. Booth 800.

Now Fosdick has Numerically Controlled Drilling Machines, versatile and fast. Here's an end to a frozen investment in drill jigs and fixtures. They're NEW. See one at The Show. Booth 800.

Drilling speed like you never saw before, with a battery of tools at the command of a button. It's yours with Fosdick's brand NEW Turret Drill. See it in Booth 800.

And that isn't all that's new. Come to booth 800 and see for yourself.

Get a proposal from Fosdick.

FOSDICK THE FOSDICK MACHINE TOOL COMPANY
Cincinnati 23, Ohio

A PROVEN BODINE MONEY-MAKING FORMULA

Bodine

CASE HISTORY No. 53

Very special production advantages achieved with very little engineering

This high quality cast BX cable connector is still strictly a volume production job . . . to be processed at absolute minimum cost. Bodine's solution to the problem has reduced *FIVE* separate handlings to *ONE*, with a single Bodine machine performing 6 operations and two inspections at 25 strokes per minute . . . 11,250 total operations per hour.

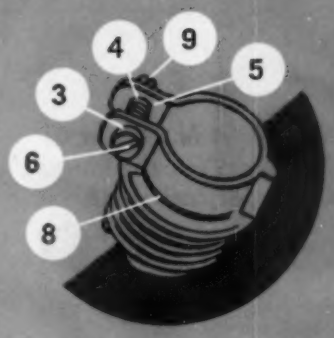
Yet this is not, in the usual sense, a "special" production unit. It is a standard Bodine Basic 41-20 machine with standardized Bodine equipment and tooling that involved very little engineering except for the dial plate. Substantial production savings are matched by equally substantial *initial* cost and time savings. Advantages include RAPID CHANGEOVER to many similar operations . . . a "complete production line" for these products in a few square feet of floor space.

This is just one current example of Bodine time and cost-saving approaches to today's urgent cost-curbing needs. Let's apply the same thinking to *your* problem. Write Dept. AM-8 today.

PRODUCTION: 25 strokes per minute. 1250 pcs/50-min. hour. 11,250 operations/50-min. hour.

THE OPERATIONS . . .

1. Manual load piece to "nest" in dial.
2. Auto inspect for correct position.
3. Drill top ear (clearance drill).
4. Drill bottom ear (tap drill).
5. Tap bottom ear.
6. Insert clamp screw (auto feed).
7. Auto check position of screw.
8. Mill flexing-slot in top ear.
9. Stake screw to prevent falling out in plating and shipping.
10. Auto eject.



THE **Bodine** CORPORATION

BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

MMT-PE

BOOTH NO. 828
The Machine Tool Exposition — 1960

3BD60

Two NILES 84 in. lathes rough-turning mill rolls in shop of large Eastern steel mill. Powered by 200 hp motors, these machines can handle pieces up to 46 ft. long.

When BIG pieces need PRECISION turning NILES means PRODUCTION

For more than a century the NILES nameplate has been affixed to fine production machine tools, including some of the largest lathes and turning machines built in this country. This experience, continuously upgraded by unrelenting research and modern technology, has resulted in the design and manufacture of lathes with largest capacity and with versatility to handle jobs requiring precision turning of the highest order. Features of the above NILES Lathes, all built for exacting workmanship on big pieces, include:

- Five hardened and ground steel ways supported by a box-section longitudinally and cross-supports cast integral with the bed. All carriage-way mating surfaces with bronze liners.
- Headstock with a straight face-plate drive and two ranges of spindle speeds: low, 1-20 rpm; high, 20-80 rpm. Spindle speeds infinitely variable within each range.
- Tailstock antifriction live center which can be locked against rotation and used as dead center. Tailstock quill is hydraulically springloaded and adjustable to suit load conditions and allow for linear expansion of the workpiece.
- Modern electronic feeds permit variable feed rates. Mechanical feeds are provided for thread cutting.
- Taper attachment is adjustable longitudinally by means of gearmotor engagement of rack and can be used independently with any carriage.

For fast, accurate turning, boring, milling or planing, turn to NILES. Lathes in sizes from 50 in., boring mills from 14 ft., planers and planer-mills from 10 ft. Expanded facilities at our new Industrial Equipment Division assure finest workmanship and good deliveries. Write Dept. MT.

You don't baby a NILES—it's no baby

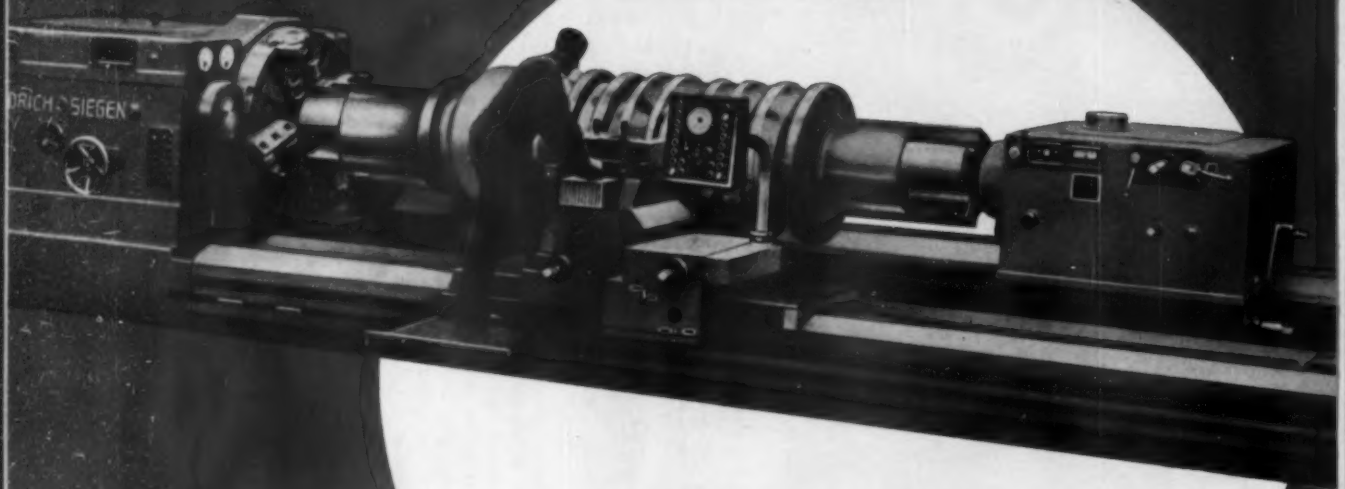
BALDWIN · LIMA · HAMILTON

Industrial Equipment Division, Philadelphia 42, Pa.

SEE US AT BOOTH 1226,
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

NEW DEVELOPMENT by WALDRICH SIEGEN

Outstanding West German Heavy Machine Tool Manufacturer



NUMERICALLY CONTROLLED ROLL GROOVING LATHE

The same machine can be used—with lamellated tool rest—for normal roll turning operations, or as a tracer lathe.

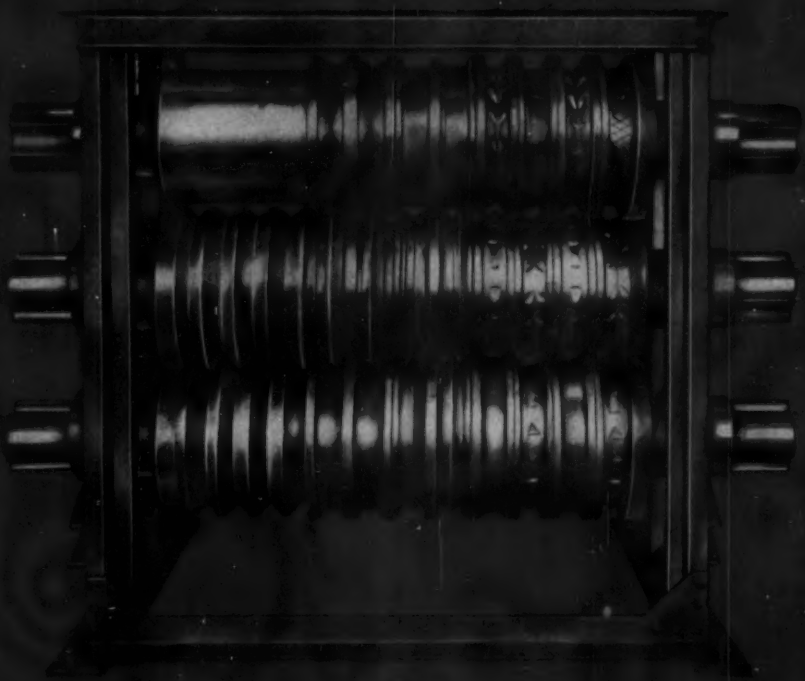
WALDRICH SIEGEN

H. A. WALDRICH G. M. B. H. SIEGEN · GERMANY

AMERICAN WALDRICH MFG. CORP. — 1232 Penn Avenue, Pittsburgh 22, Pa.

AUTOMATIC SEQUENCE

of turning operations from the punched tape to the finished roll



- No need for specially trained operators
- No templates
- Longer service life of rolls, as our positioning system computes automatically the most favorable position of grooves.

WALDRICH SIEGEN

HEAVY MACHINE TOOLS

AMERICAN WALDRICH MFG. CORP., 1232 Penn Avenue, Pittsburgh 22, Pa.

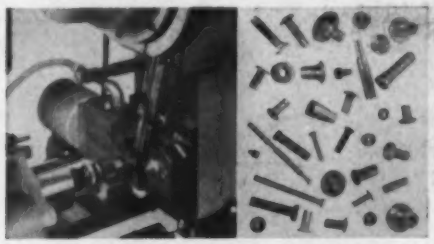
CIRCLE 624 READER SERVICE CARD

NOW AVAILABLE...

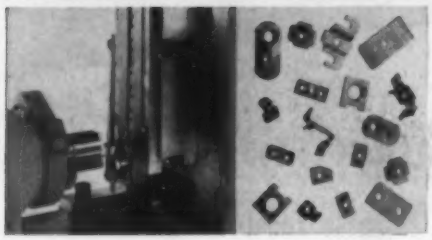
for automatic drilling, tapping or threading

Hand feed or hopper feed with or without air-operated clamp

NOW...drill rivets faster with minimum tooling costs



Drills 500-3600 per hour; hopper feed; air-operated clamping. Capacity #74 (.0225") to 3/16" in mild steel.



Taps 4000 per hour hand feed magazine. Capacity #0 to 1/4" fine pitch in mild steel.

A new horizontal version of the same operating principles long used in Snow vertical machines. Snow machines reduce changeover time, and cut tooling costs to a ridiculous minimum. On your next job, let us show you what the Snow method can do. Submit samples and prints.

Snow Manufacturing Company, Dept. A, 435 Eastern Avenue, Bellwood, Illinois (Suburb of Chicago)

SNOW *master fixtures save dollars and days in tooling costs*

Sharp Clean Cuts EVERY TIME

Many thicknesses and sizes of metal are cut on this Steelweld Shear every day. Thanks to Steelweld's exclusive MICRO-SET knife adjustment, it is easy to set the knife clearance to the exact amount which will produce the best cut for every plate run through the machine.

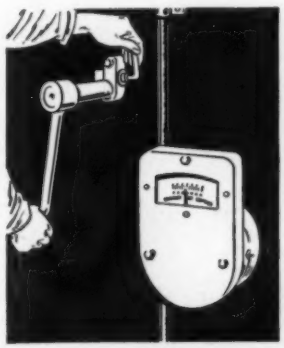
If desired, the knife clearance can be set for an average thickness and all plates cut without changing the clearance. This procedure is used with most shears because to change knife clearance on them is a tedious, difficult operation which usually puts a machine out of service for hours.

In contrast, knife adjustment on Steelwelds is made in a few seconds. It's simply a matter of turning a crank until an indicator points to the figure representing the thickness of plate being cut. No bolts to loosen; no parts to move. There is no need for using "average" knife settings.

The clutch and brake unit is another outstanding feature of Steelweld Shears. As it is air-operated, it is quick, snappy in action. Its low-inertia design assures cool operation, even after long continuous production runs, because energy to be dissipated is minimized and working pressure necessary on clutch and brake facings is greatly reduced.

The many features of Steelweld Shears make it worth your while to get all the facts.

Because of MICRO-SET Knife Adjustment



MMT·PE

Booth 814
Machine Tool
Exposition

Steelweld Shears are made in all sizes for plate to thicknesses up to 2 inches and lengths to 30 ft.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

STEELWELD MACHINERY DIVISION

THE CLEVELAND CRANE & ENGINEERING CO.

1446 EAST 289th STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

CIRCLE 626 READER SERVICE CARD ▲

CIRCLE 627 READER SERVICE CARD ►

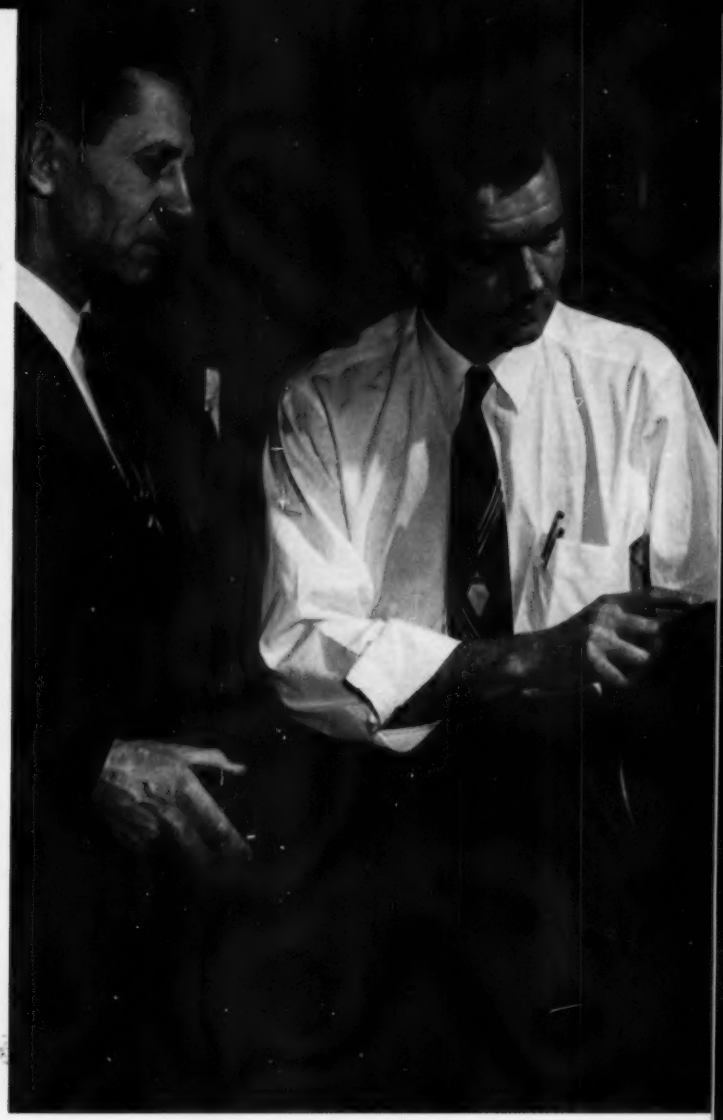
Iron Fireman Manufacturing Company changes to Gulfcut® oil,

GULF MAKES THINGS

A machining job that had been a problem for years was the test given a Gulfcut oil at Iron Fireman Manufacturing Company, Cleveland, Ohio. The job was hobbing 78-tooth, combination 6-8 pitch main drive gears of UMA-3 forging steel. Until the test, hobs had to be reground after every eight gears—once every cutting cycle.

By using Gulfcut 21C oil, Iron Fireman engineers found that they could get the same tolerances and the same production as before, and that they could cut approximately 30 gears or nearly 4 cycles before re-grinding. In addition, they were grinding one-third less off the hobs than before!

"With 275% increase in hob life, we're getting pretty close to optimum on this job," says Stanley J. Kovac,



At right, C. J. Wires, of the Production Engineering Staff, Iron Fireman Manufacturing Company, with T. F. Irving, Gulf Sales Engineer who recommended Gulfcut.

More than 300 kinds of steel, cast iron and brass gears are hobbed by Iron Fireman Manufacturing Company, all with the aid of Gulfcut oils. Pictured here is a 12-tooth, 6 pitch Ledloy steel pump drive gear, O.D. 2.333, tolerances +.0000, −.0015. Oil is Gulfcut 21C.

increases hob life 275% . . .

RUN BETTER!

Chief Production Engineer. "Performance like this has proved Gulfcut oil to us. We're now using it on all gear cutting operations. We cut 300 kinds of gears, of brass and cast iron, as well as steel."

Do you have a tough machining problem? See how Gulf makes things run better! Just call a Gulf engineer at your nearest Gulf office.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF

5P-9822

ACCURACY

...to millionths of an inch

Accuracy that's a must for tool rooms . . . so fine it can be measured only by a light bounce, so precise it produces micro-inch finishes at production speeds. This is the accuracy you get in the No. 560 Grand Rapids Precision Tool Room Type Hydraulic Feed Surface Grinder . . . accuracy assured by such features as hand-scraped V-shaped ways, rigid one-piece column and base casting, truly automatic cross feed and extra-heavy spindle. Why settle for less?

For information on the No. 560 or the Nos. 550, 360 and 350 Tool Room Type Surface Grinders, send a note on your letterhead.

GALLMEYER & LIVINGSTON

Booth 751, The Machine Tool Exposition

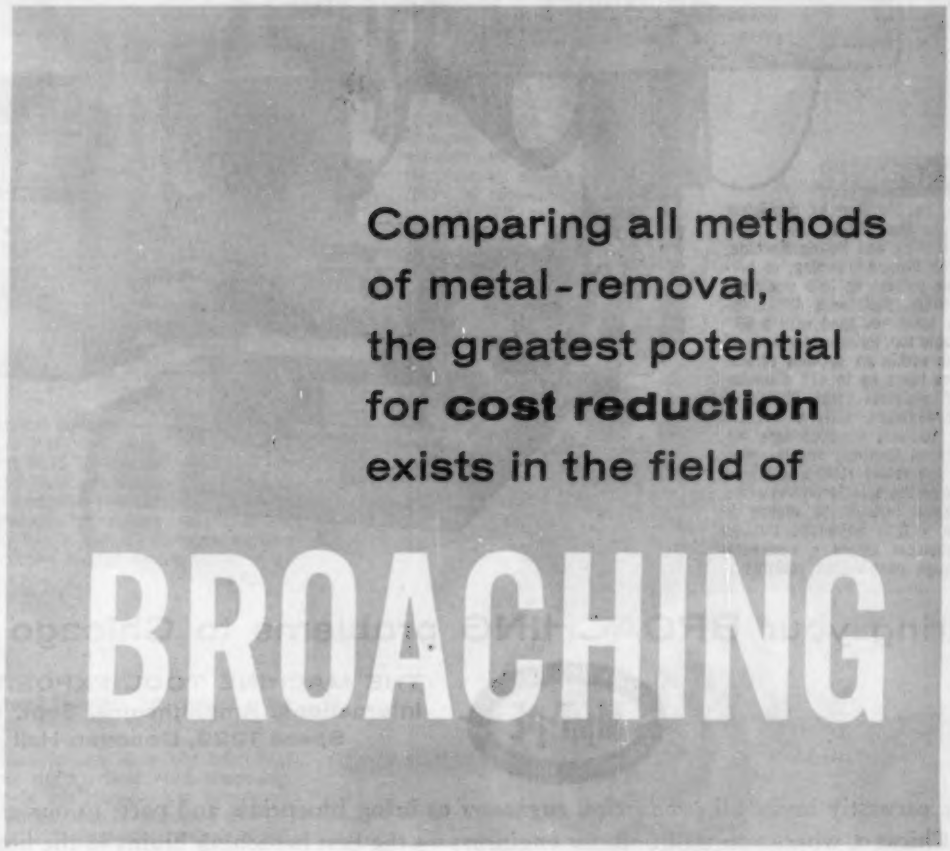
MMT-PE

GALLMEYER & LIVINGSTON CO.

430 STRAIGHT AVE., S. W. GRAND RAPIDS, MICHIGAN

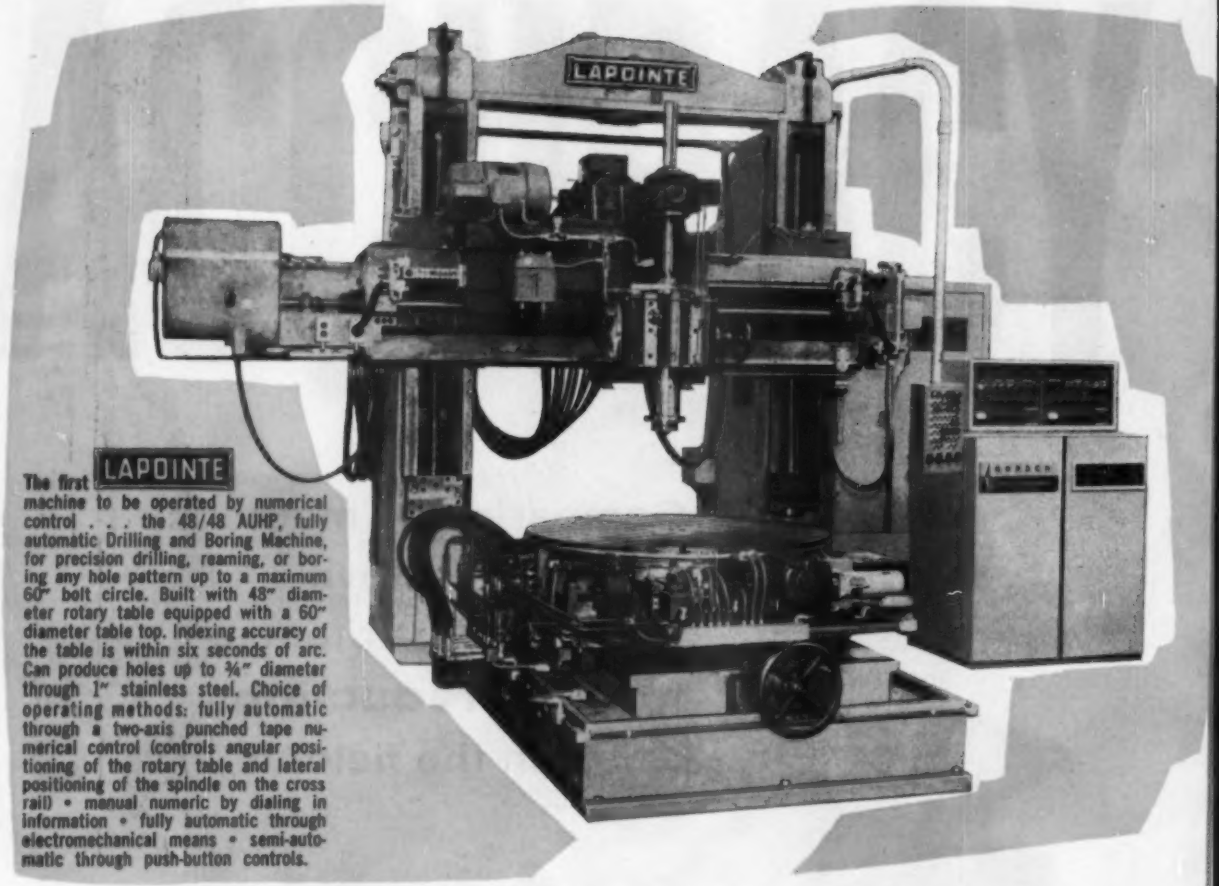
◄ CIRCLE 628 READER SERVICE CARD

▲ CIRCLE 629 READER SERVICE CARD



Ask LAPOINTE to prove it!

see inside



The first LAPOINTE machine to be operated by numerical control . . . the 48/48 AUHP, fully automatic Drilling and Boring Machine, for precision drilling, reaming, or boring any hole pattern up to a maximum 60" bolt circle. Built with 48" diameter rotary table equipped with a 60" diameter table top. Indexing accuracy of the table is within six seconds of arc. Can produce holes up to ¾" diameter through 1" stainless steel. Choice of operating methods: fully automatic through a two-axis punched tape numerical control (controls angular positioning of the rotary table and lateral positioning of the spindle on the cross rail) • manual numeric by dialing in information • fully automatic through electromechanical means • semi-automatic through push-button controls.

Bring your BROACHING problems to Chicago . . .

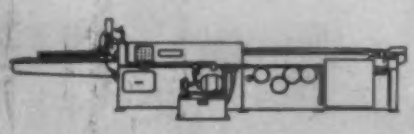
MMT-PE

THE MACHINE TOOL EXPOSITION
International Amphitheatre, Sept. 6-16
Space 1229, Donovan Hall

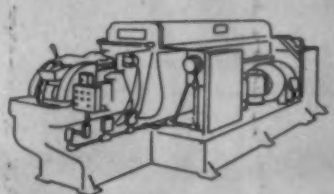
We earnestly invite all *production engineers* to bring blueprints and parts to our exhibit in Chicago, where you will find our engineers — the best broaching brains in the business — ready to analyze your particular problem and see if it can be solved by

LAPOINTE BROACHING

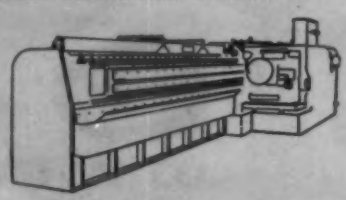
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC

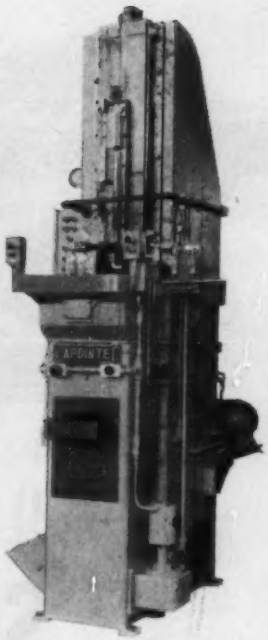


CH CONTINUOUS BROACHING, ELECTRIC



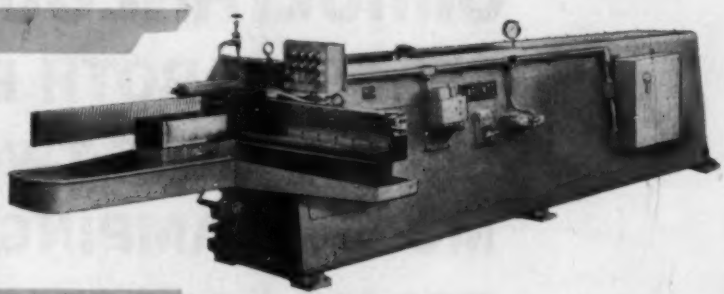
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

You will SEE these 5 machines in full operation

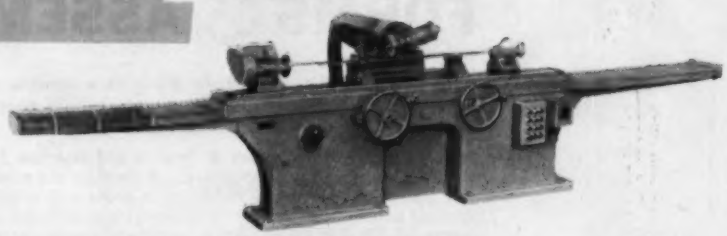


"Eager Beaver" . . . our Small Pull-Down Broaching Machine, the most economical broaching machine in the low-cost range. Complete with automatic puller, work nest for holding one part, and automatic coolant equipment. Designed with the Saginaw Steering Ball Screw, it operates at broaching speeds 5-10 FPM. Part being broached: Starting with a partly machined hole of .750" the machine will broach a square, hex, involute, serration, six-spline or one-spline form in the hole.

UVHS, Universal Vertical Hydraulic Single Ram Broaching Machine, 5-Ton 54" stroke, equipped for fully automatic broaching. Part being broached is an extractor for a noted American rifle manufacturer. Steel bar stock .145" x .230", is automatically fed, clamped, broached and cut off to the proper length of part. No further machining operations are necessary on the broached surfaces. Using a cutting speed of 30 FPM, 175 pieces per hour may be obtained.



HP-30 Horizontal Broaching Machine, performing an operation that is common to **every metal-cutting plant.** A 15-Ton Horizontal Hydraulic pull type broaching machine equipped with hydraulically operated vise type fixture. Machine is designed primarily for squaring the ends of bar stock of any length, and will accommodate bars up to a maximum of 5¾" square.



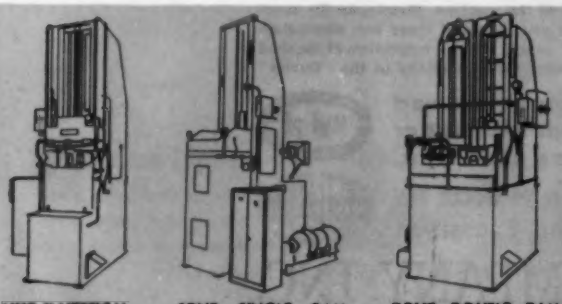
Universal Broach Sharpener, 72" capacity — the most efficient, completely modern sharpener on the market. Sharpens either internal or surface broaches. Equipped with Micro-Feed Attachment for minimum stock removal when sharpening. Incorporated in this machine is a three-speed Frequency Changer, used in connection with the spindle motor to obtain spindle speeds to 10,800 RPM maximum.

While at the Show, come in and talk over our unusual LEASE PROGRAM.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUB-7 VERTICAL PULL-UP ELECTRIC

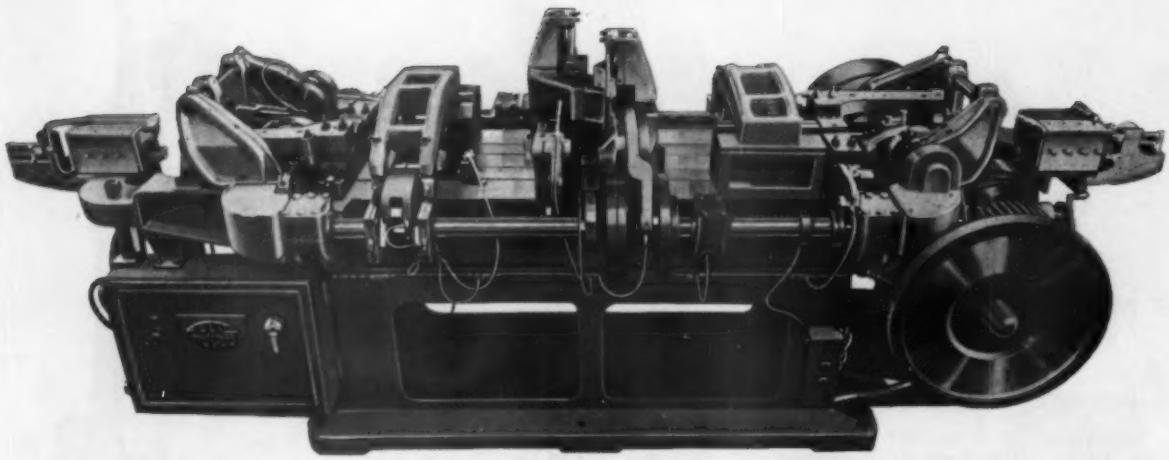
SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING



U.S. DUPLEX MULTI-SLIDE®

SIMULTANEOUSLY

FEEDS AT BOTH ENDS & PRODUCES TWO OR MORE STAMPINGS & FORMS & ASSEMBLES

The new U.S. Duplex Multi-Slide is a double ended machine which more than doubles previous production potentials.

With the U. S. Duplex you can ■ Produce and assemble 2 different stampings from the same or dissimilar materials. ■ Produce and assemble 2 complementary stampings. ■ Produce stampings from one end, wire form from the other end and assemble. ■ Produce 2 stampings and assemble with hopper-fed, prefabricated parts. ■ Make 3 piece assemblies, feeding material from both ends — and from the top. ■ Make 2 or more identical or different stampings not requiring assembly — and of the same or different material. ■ And, can be operated as a conventional Multi-Slide by feeding material into one end only. **Standard U.S. Duplex Multi-Slide equipment includes a feed, stock straightener, check and ram action at each end and a common 4-slide forming position with double, vertical strippers at the center. Material up to 3" wide can be fed into both ends of machine simultaneously. Feed length is adjustable up to a maximum of 6" and can differ from each end of the machine. Investigate the economies a U.S. Duplex Multi-Slide can give you. A few of these are: elimination of secondary operations; savings in floor space; ease of inspection of finished assemblies; and fewer rejects . . . all through the versatility of the "Duplex".**

Write today for full information and specifications. Send us your samples or drawings today and let us show you.

MMT-PE

MULTI-SLIDE

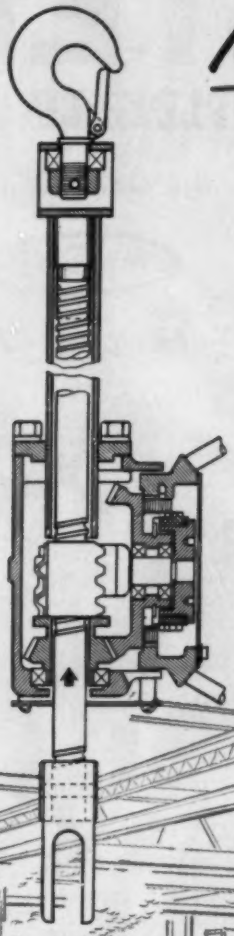
See the U. S. Duplex Multi-Slide in Booth No. 842 at the 1960 Machine Tool Exposition.

U.S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

U. S. Multi-Sliders® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

NEW Whiting Ladle Handler Lifts 100 lbs for Every Pound of Effort!

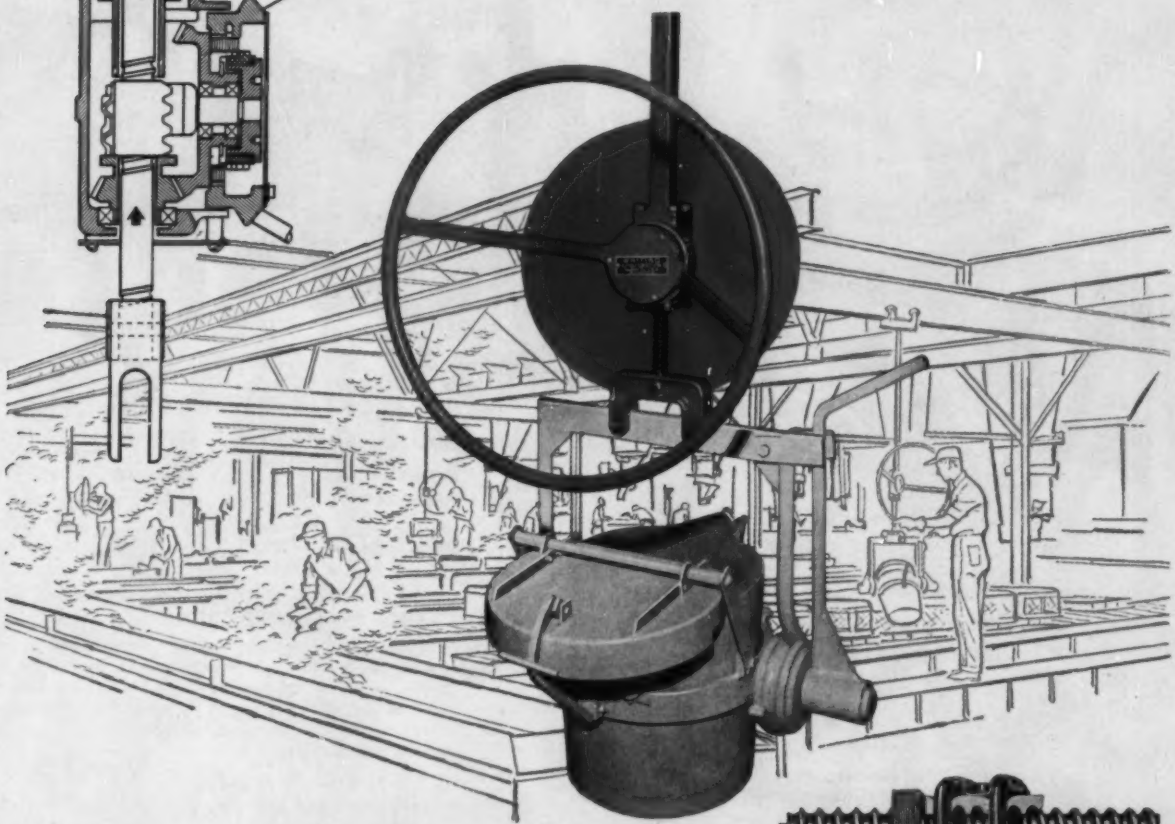


. . . made possible by the Saginaw b/b Screw!

The Whiting Corporation, heavy foundry equipment manufacturers, designed a ladle handler that lets the operator manually raise and lower a gross weight of over 2250 pounds with maximum ease and control. The Saginaw Ball Bearing Screw got the actuation job!

A turn of the handwheel on the new 'H-E' Ladle Handler transmits torque to the Saginaw Screw which converts *rotary* motion into *linear* motion with over *90% efficiency*. This, with a unique clutch-brake spring, helps the operator LIFT 100 POUNDS FOR EVERY POUND OF EFFORT, and maintain control at all times! The Saginaw Screw also provided savings in maintenance, wear, parts and weight.

The Saginaw Screw may be able to improve your product's performance and increase its sales acceptance. Write or telephone Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan—*world's largest producers of b/b screws and splines.*



A Size and Type for Every Need...

Have been built as small as 3/16 in. B.C.D. and 3/4 in. long, as large as 6 in. B.C.D. and 40 ft. long. Larger sizes can be built to your order.

Saginaw

ball bearing Screw

WORLD'S MOST EFFICIENT ACTUATION DEVICE

BURGMASTER

THE WORLD'S MOST COMPLETE LINE OF

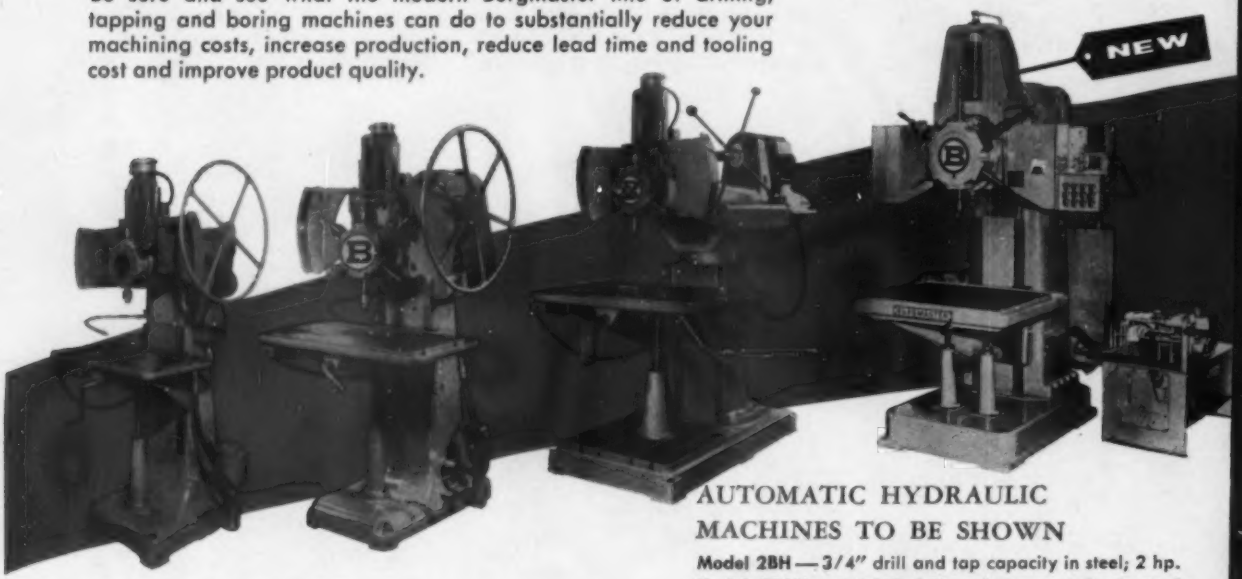
13 Burgmaster machine models will be shown at the Machine Tool Exposition. The many new developments in the Burgmaster line will be introduced by means of actual production demonstratons. Three entirely new Burgmaster models will be introduced and there will also be seven tape controlled Burgmaster machines in operation to show how you can reduce lead time from weeks to hours while increasing production by fully automatic machining.

Be sure and see what the modern Burgmaster line of drilling, tapping and boring machines can do to substantially reduce your machining costs, increase production, reduce lead time and tooling cost and improve product quality.

THE MACHINE TOOL

MMT-PE

Exposition - 1960



HAND OPERATED MODELS TO BE SHOWN

Model 1C—1/2" drill and tap capacity in cast iron; 1 hp.

Model 2B—3/4" drill and tap capacity in steel; 2 hp.

Model 2BR Radial—3/4" drill and tap capacity in steel; 2 hp.

HOW HAND OPERATED BURGMASTER TURRET DRILLS INCREASE PRODUCTION

Fast power turret indexing to perform a sequence of machining operations; Preselective spindle speeds — automatically changed for each spindle; Precision depth control; Quick setup — ideal for short run work.

See the new Burgmaster Lead Screw Tapping Head in action. This attachment greatly improves the accuracy and finish of tapped threads and eliminates scrap due to pulled or loose threads.

AUTOMATIC HYDRAULIC MACHINES TO BE SHOWN

Model 2BH—3/4" drill and tap capacity in steel; 2 hp.

Model 25AH—1-1/4" drill and tap capacity in steel; 7-1/2 hp.

Model 3BH—1-1/2" drill and tap capacity in steel; 10 hp.

AUTOMATIC HYDRAULIC MACHINE FEATURES SET THE PACE FOR FASTER PRODUCTION AND HIGHER QUALITY

Automatic operation determines the pace — one man can operate more than one machine with less effort and fatigue, while increasing production; Simple controls mean faster setups ideal for short run work; Pre-selective infinitely variable spindle feeds, pre-selective spindle speeds and pre-selective depth control.

NEW IMPROVED FEATURES

- Temperature and pressure compensated hydraulic feed — infinitely variable.
- Direct reading rate of feed indicator.
- 4-speed motor drive for wider speed range.
- Reciprocating feed for chip removal on deep hole drilling.
- Forged spindle with gear integral.
- "V" type automatic turret clamping ring.
- Quick-set depth stops.
- Improved lead screw tapping head.

PRESENTS.....

TURRET DRILLING, TAPPING AND BORING MACHINES

SEE 7 TAPE CONTROLLED BURGMASTER TURRET DRILLS AT THE N-M-T-B EXPOSITITION BOOTH 834

TAPE CONTROLLED MACHINES TO BE SHOWN

Model 2BHT — 3/4" drill and tap capacity in steel; 2 hp; 10" x 18" positioning table; GE 2-axis tape control.

Model 2BHTL — 3/4" drill and tap capacity; 3 hp, 4-speed motor; 15" x 26" positioning table; GE 3-axis tape control.

Model 2BHTL — 3/4" drill and tap capacity; 3 hp, 4-speed motor; 15" x 26" positioning table; Hughes 3-axis tape control.

Model 25AHT — 1-1/4" drill and tap capacity in steel; 10 hp, 4-speed motor; 15" x 26" positioning table; GE 2-axis tape control.

Model 3BHT — 1-1/2" drill and tap capacity in steel; 15 hp, 4-speed motor; 20" x 30" positioning table; GE 2-axis tape control.

Model 3BHTL — 1-1/2" drill and tap capacity in steel; 15 hp, 4-speed motor; 30" x 45" positioning table; GE 2-axis tape control.

Model 3BHTB — double housing planer type; 1-1/2" drill and tap capacity in steel; 15 hp, 4-speed motor; 48" x 60" positioning table; GE 2-axis tape control.

WHAT BURGMASTER TAPE CONTROL MEANS TO YOU

Greatly reduced lead time — get into production in a few hours; Eliminates complex fixtures or index devices. Drill jigs and bushings not required; Much less spoilage on difficult jobs — machine does not depend on operator's skill; Greater accuracy — holds hole location to .001", repeatable to .0005"; Easy to program — 1 minute per hole location; Prepare tape — 4 holes per minute; Set-up machine — 3-5 minutes per tool.

Write for Bulletin describing the complete line of Burgmaster 6 and 8- Spindle Turret Drilling, Tapping and Boring Machines. Forty minute 16 mm sound film showing all Burgmaster Turret Drills in operation is available without charge.

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MANUFACTURING COMPANY, INC.
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BURGMASTER DIRECT SALES OFFICES: Ridgewood, N.J., 86 North Maple Ave., Gilbert 4-3002 • **Chicago 5, Ill.,** 4908 Lincoln Ave., LOng Beach 1-1178 • **Cleveland 7, Ohio,** 14706 Detroit Ave., ACademy 6-7030 • **Detroit 37, Mich.,** 13730 W. Eight Mile Rd., LIncoln 8-4333 • **San Francisco, Calif.**

Plus dealer representatives in other industrial centers.

2 MICRO-PATH AUTOMATION SYSTEMS

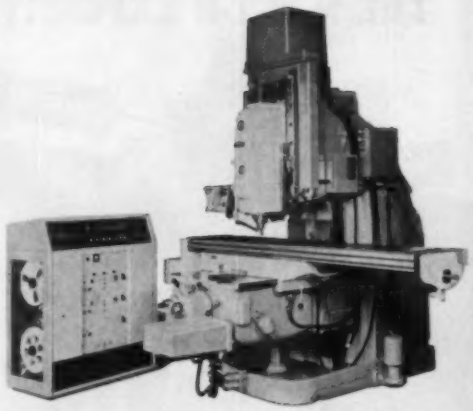
MPI 401

MAGNETIC TAPE CONTROL FOR CONTINUOUS PATH OPERATIONS

MICRO-PATH MODEL 401 offers utmost programming simplicity and installation economy to continuous path operations . . . can be installed on existing tools or designed into new equipment.

RECORD-PLAYBACK PROGRAMMING utilizes a special electronic stylus to trace a finished part or template. Programs can also be made direct from drawings utilizing drafting instruments. Pulses actuating the table in its desired path are simultaneously recorded on magnetic tape. Playback of the tape duplicates the path and the part automatically. Computer techniques are bypassed.

3 AXIS OPERATION—Model 401 operates in any 2 out of 3 axes simultaneously, permits production of mold cavities and other contouring as well as simple profiling.



MPI 801

PUNCHED TAPE POSITIONER FOR POINT-TO-POINT PROGRAMS

THE NEW MICRO-PATH 801 POSITIONER is a revolutionary advance in point-to-point programming, with design flexibility that guards your investment against obsolescence!

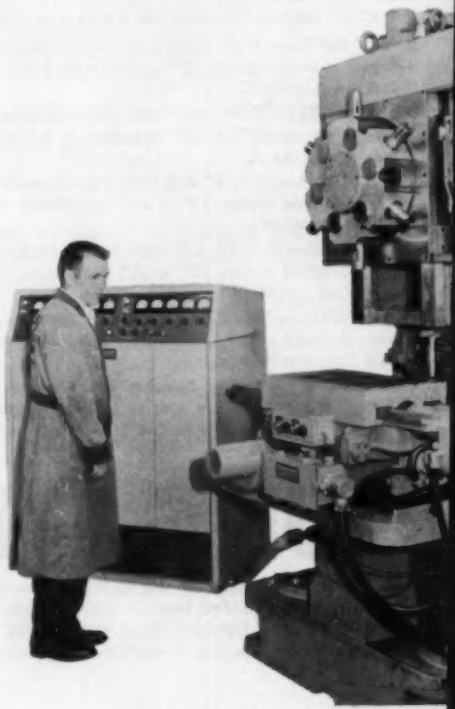
PUNCHED TAPE PROGRAMS—Easy preparation of your own programs in your own plant with standard Flexowriters or other BCD units.

COMPLETELY TRANSISTORIZED—Transistors perform all switching functions and logic, insuring virtual freedom from maintenance . . . no vacuum tubes, no mechanical relays, no oxidizing contacts, no mechanical motion and resulting wear.

HIGH LOCATING SPEED—Fastest system yet! Utilizes full traverse rates from point to point. As location is reached gage pulses count overtravel. Error signal between pulse voltage and program drives servo, returning table to location at a rate proportional to overtravel.

DIRECT DECIMAL READ-OUT—Table position is decimally indicated at all times on meters contained in console panel.

MANUAL INPUT—Single parts can be produced without taped programs by setting up manual controls for each position. Parts produced by tape programs can also be amended, adding new hole positions or permitting individual deviations.



CIRCLE 637 READER SERVICE CARD

WITH EASY PROGRAMMING IN YOUR OWN PLANT

FAITHFUL REPRODUCTION—A closed loop system keeps the machine "on program" with part-to-part accuracy of .001". Electronic repeatability is to .00025".

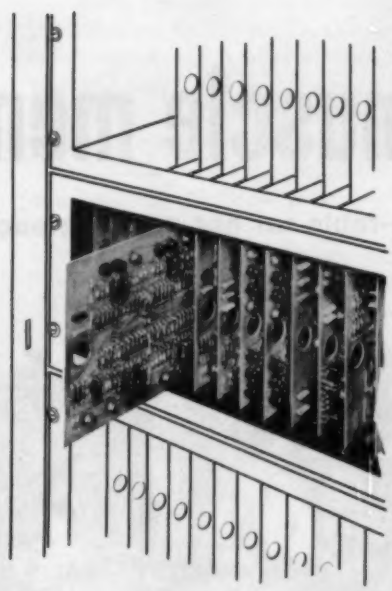
ELECTRONIC SCALE FACTOR—Enables programming from a print 4 times larger than the part . . . reduces errors, allows more operator reflex time for programming.

ELECTRONIC BACKLASH CONTROL—One program can be used interchangeably on several machines even though lead screw wear differs in each. Compensation is made at the console of the machine in use without altering the tape.

LOW COST—As little as 1/5th the cost of other systems producing similar results!

WHERE MICRO-PATH MAKES BIG SAVINGS—Chip production time greatly increased. Faster traverse rates between cuts with no risk of work spoilage. 100% tool loading at highest practical cutting speed. Elimination of multiple setups, drill jigs, rotary tables and other special positioning equipment. Avoids operator errors. Insures consistent accuracy, part-to-part.

GET ALL THE FACTS ON MICRO-PATH! Before installing any automation system, consult with Micro-Path! Prompt recommendations will be forwarded by our engineering department. Please include operating requirements in inquiry.



MODULE DESIGN INSURES EASY MAINTENANCE—Each 801 contains 37 individual plug-in printed circuit components. Built-in glow lamps indicate correct functioning or instantly spot a faulty board for quick factory exchange or local repair. 13 "spare" modules satisfy all requirements of the 37 boards.

FLOATING "ZERO"—The starting reference point, or "zero," can be located anywhere on the table or workpiece and can be subsequently relocated, if desired. All subsequent measurements accurately accrue from the new location.

"MIRROR" IMAGES can be produced from the same tape with axis reverse switches.

CONTINUOUS PATH CONVERSION—With the addition of director modules and access to computers and programming techniques, the 801 can be expanded to a combination "POSITIONING-CONTINUOUS PATH" system.

MODEL 850 2-AXIS POSITIONING TABLE—Ideal for high precision point-to-point and continuous path applications. The table glides on pre-loaded rollers running on hardened steel ways and is driven by hydraulic rotary motors attached to ball lead screws. The motors are controlled by hydraulic servo valves responding to the electronic commands. Static friction and backlash are so low that a .0001" command results in a .0001" motion, starting from a stationary position! Both axes are capable of simultaneous motion.

SPECIFICATIONS: Absolute linearity: ±.0002"/ft. at 70°F. Repeatability: ±.0001". Positioning Speed: 50" min. @. 0001" least count; 200" min. @ .001" least count.

MICRO-PATH INC

A SUBSIDIARY OF UNITED INDUSTRIAL CORPORATION

10321 ANZA AVENUE, LOS ANGELES 45, CALIFORNIA

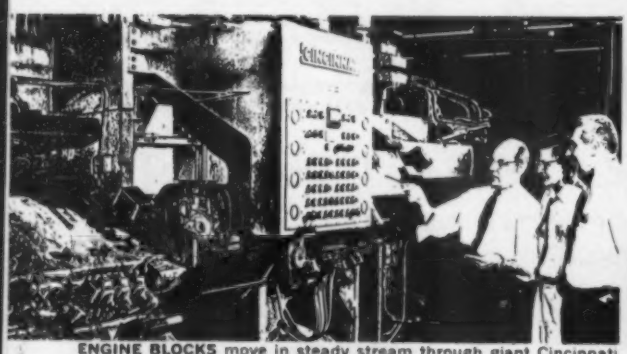
CIRCLE 638 READER SERVICE CARD

SWEATING IT OUT—Converting Lincoln-Mercury engine production to Falcons took plenty of manufacturing teamwork. In this session with Area Superintendents and Department Managers are: (1) Stan Gordon, Manager, Manufacturing Engineering; (2) Harvey A. Rothenberg, Plant Engineering Manager; (3) Stephen J. Kadar, Quality Control Manager; (4) Frank Zeiger, Production Manager; (5) Earl Dilworth, Production Control Manager.

FALCON...big sweat for

Ford's manufacturing-muscle men

Management team saves 12 months on production time-table for hot new compact.



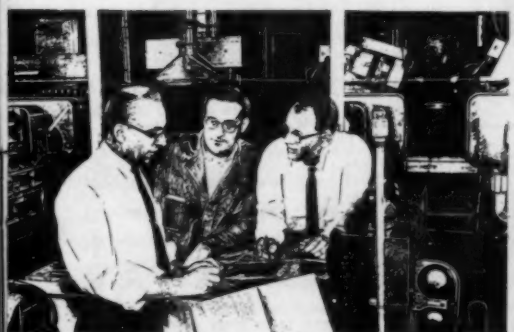
ENGINE BLOCKS move in steady stream through giant Cincinnati machine which alternately broaches the pan rail, then the cylinder head face. A new machine, added for Falcon production, it is checked by Steve Kadar; Superintendent of Maintenance, Ed Shalek and Harvey Rothenberg.

CRANKSHAFTS are balanced to accuracy up to 1/10 of 1 ounce-inch on electronically controlled Tinius Olsens. These machines were also rebuilt from the Mercury line. On the job (left to right): Cam and Crank Area "C" Superintendent Lyle Gilroy; Line Foreman William Kettler; Frank Zeiger; and Stan Gordon.

From drawing board to proving ground in less than 14 months—instead of the customary two to three years . . . that's the sizzling story of the best-selling new Ford Falcon. And behind it, as you might suspect, are hundreds of the everyday manufacturing miracles that add sweat and zest to a production man's life . . . and make the difference between P and L on the company's financial report.

One of the major miracles was retooling the Engine and Foundry Division's Lima, Ohio, V-8 engine plant to produce the Falcon's in-line-6 without shutting down production on V-8's for Lincoln and Mercury. The formula: Ford's ingenious production concept that permits taking machine tools apart and putting them back together like building blocks. One result: substantial orders for tool builders . . . with half the plant's equipment rebuilt, half built new from scratch.

The story was told in detail in American Machinist/ Metalworking Manufacturing and is typical of the stories that make AM/MM such vital reading for some 42,000 metalworking manufacturing men. Every other Monday, they turn to it as a source book for new ideas, new machines, new materials in their constant search for better, less costly ways to make things of metal. If your product can help them, give them the facts in AM/MM. They read it with their eyes and minds wide open, ready to buy. That's why it is the most direct, efficient, and effective way of selling to metalworking.



CYLINDER BORES are made automatically on Falcon straight-six engine blocks. These Cross machines originally bored Mercury V-8 blocks. Studying machine conversion blueprint are Stan Gordon; Block Production Line Foreman Ray Prior; and Frank Zeiger.

To sell men who matter in metalworking, your advertising belongs in

American Machinist / ***Metalworking Manufacturing***

A McGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N Y

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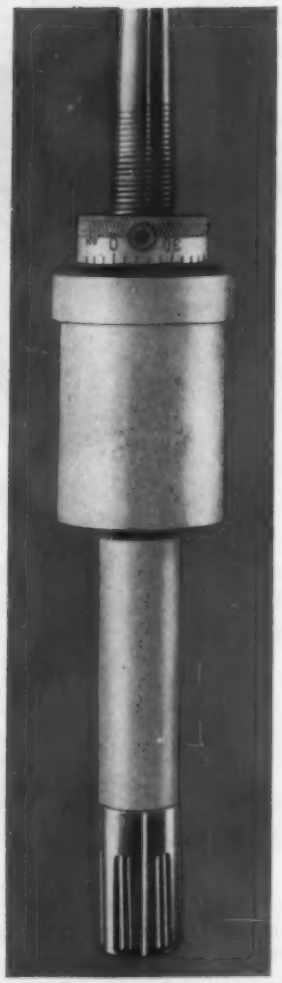


WITH THE MADISON microller® BURNISHING TOOL, YOU GET A FINE FINISH – FAST!

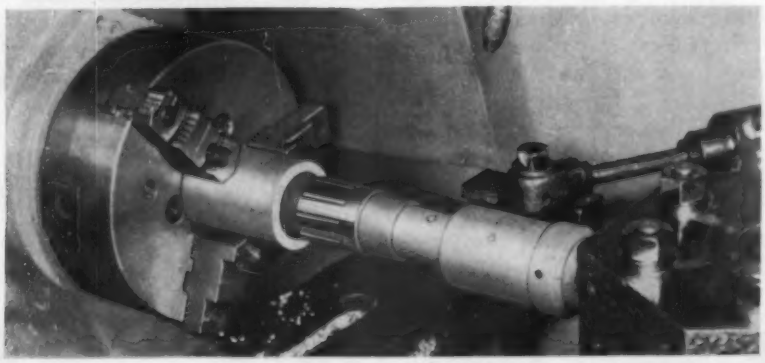
This revolutionary tool finishes rough bored or turned surfaces, of 125 mu. and higher, to 5 mu. and lower at feed rates of 8 to 12 inches per minute.

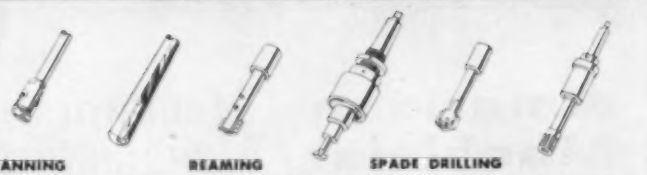
Over 1000 major metalworking companies are continually replacing grinding, honing and lapping operations with the Madison Microller.

Here's why:

- The Microller gives you, in one pass, a finish far superior to any that can be produced with abrasive processes
- You run thousands of parts without tool wear
- No operating skill required
- Can be used in any standard shop equipment
- Finishes any machineable metal—creates a condensed, compacted surface

For additional information, call your Madison representative, or write for our latest bulletin.





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American Machinist / *Metalworking Manufacturing*

Special Reports

These widely accepted monographs on major metalworking subjects have been published in AMERICAN MACHINIST/METALWORKING MANUFACTURING since 1938 and now number 494—as of Aug 8 '60. A complete list of those published since No. 273 (Jan 22 '51) is given below.

All of those shown in bold-face type are still in print and may be obtained by writing to Reader Service, AMERICAN MACHINIST/METALWORKING MANUFACTURING, 330 W 42nd St, New York 36, NY. Please enclose with your order cash or check at the following rates: for an 8 or 10-page Report, 25¢; for a 12-page Report, 30¢; for a 16-page Report, 35¢; others as marked. Cost is lower for quantities over 100.

Photographic reproductions of out-of-print Reports may be obtained at 10¢ per page. A group of seven Reports dealing with hand tools and basic operations on standard machine tools has been combined into a paper bound booklet, "Tools of Our Trade," priced at $1.25 per copy. All items are postpaid.

A list of Special Reports currently available may be obtained free of charge by writing to the above address.

1951

273 Metalworking Guide to Defense Business—Jan 22 '51, 16p
274 How GE Makes Turbojets—Feb 5 '51, 20p
275 How to Choose and Use Automatic Lathes—Feb 19 '51, 16p
276 Thread Chasing . . . and How to Do It—Mar 5 '51, 16p
277 How to Spin Metals—Mar 19 '51, 16p
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281 Better Tapping—May 14, '51, 16p
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283 How to Work Titanium and its Alloys—Jun 11 '51, 9p
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285 How to Mill, Roll, Grind Threads for Production—Jul 9 '51, 24p
286 Plant Protection—July 23 '51, 13p
287 Induction-Heater Maintenance Manual—Aug 6 '51, 16p
288 Five Ways to Form Gears—Aug 20 '51, 16p
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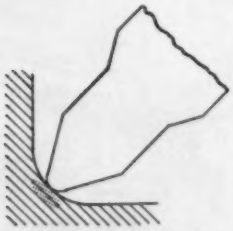
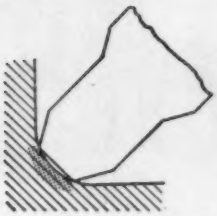
(continued on page 394)

ENGINEERED FOR PRODUCTION

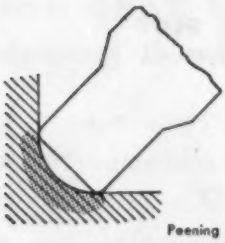
This is how fillet rolling works:



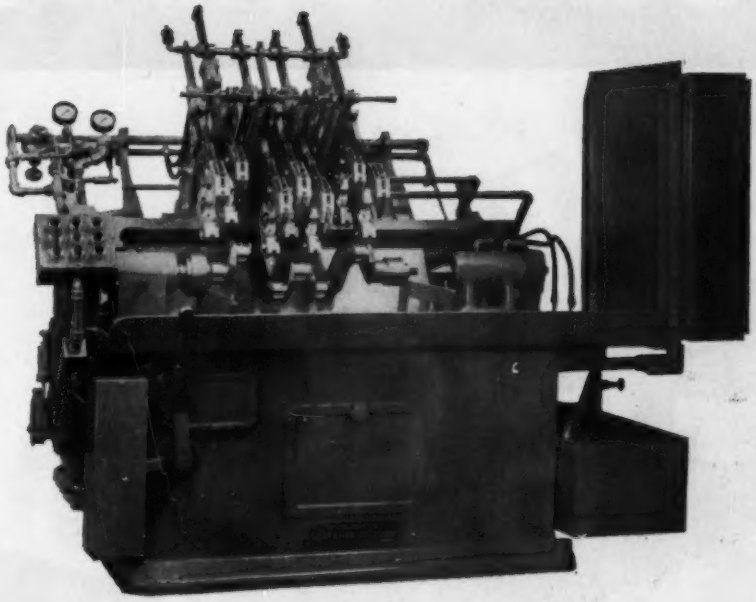
Two rollers under hydraulic pressure turn against each fillet as crankshaft is rotated.



As each roller turns, a V-track on its periphery expands outward across fillet surface.



Peening effect on metal compresses skin, creates compressive stresses that prevent fatigue failures.



Fillet rolling . . .

low-cost process eliminates fatigue failure

Fillet rolling is a scientific method of strengthening crankshafts against fatigue failure. Footburt-Schraner automatic fillet rolling machines produce controlled stresses at the critical points of the crankshaft—the fillets—cutting fatigue failure drastically at the points where it is most likely to occur. Production is high, and the machine is adjustable for various sizes of work. Our specialists have years of experience in fillet rolling. Send us your blueprints and production specifications. We will be glad to advise you on your needs.

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio

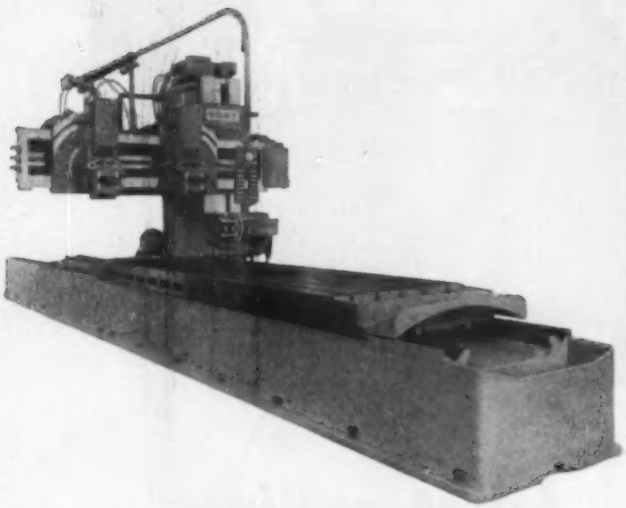
Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.

..... Write for Circular 512

FOOTBURT

LEADERS IN FILLET ROLLING

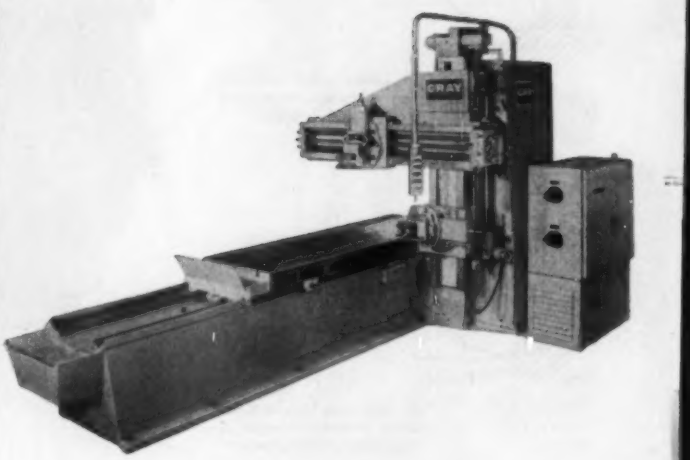
four reasons for



new GRAY double cutting universal planer

- 48" x 14'.
- Space-saver drive with floating shaft.
- Loop lubrication. Square lock rail and column.
- Improved head design. Simple feed.
- Duplex tables. Air tool lifters.
- Full remote control pendant station.
- Non-metallic table ways.
- 35/75 h.p. variable voltage drive.
- Table speed range 30—300 f.p.m.
- Feed range 64 increments 0—1".

on display — Booth 1350



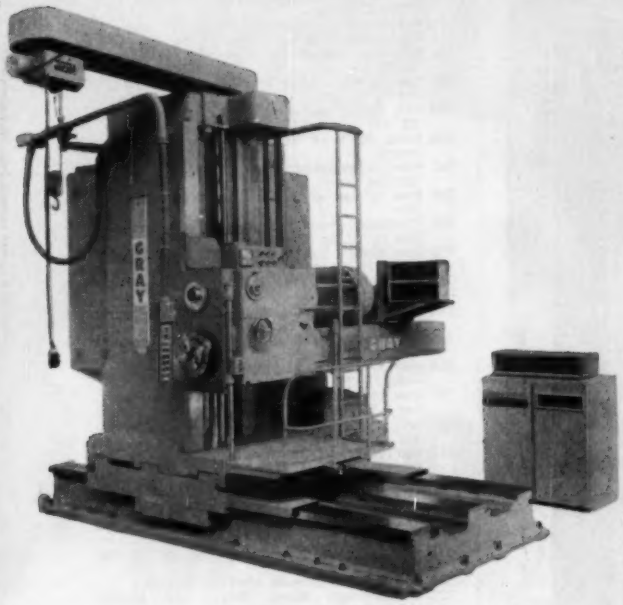
new GRAY flying scot universal planer

- 30" x 8'.
- Maximum planing height 31".
- Table width 30".
- Table speed range 30—300 f.p.m.
- Feed range—infinite 0—½".
- 60/75 h.p. variable voltage drive 180/1800 r.p.m.
- Maximum planing width 50".

on display — Booth 1350

new GRAY

going to Chicago



new GRAY horizontal boring drilling & milling machine

- 6" dia. nitralloy bar. 60" bar travel.
- 72" vertical head travel.
- 96" column travel on runway.
- 36" column cross travel.
- 50 h.p. spindle motor.
- 4.5—900 r.p.m. spindle speed range.
- Full remote control pendant station.
- Phase III spacesetter equipment for — horizontal movement of column along runway and vertical movement of head on column—tape reader and reading devices together with related control in floor mounted console.

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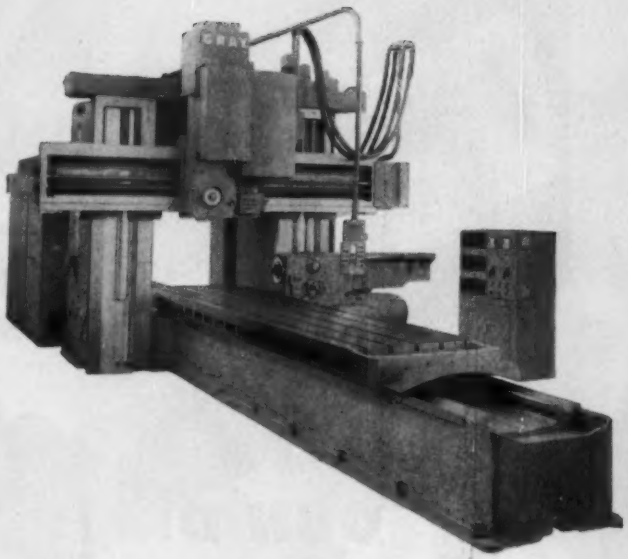

new GRAY planer type milling machine

- 48" x 48" x 16'.
- 10" quill, 50 h.p. non-swiveling milling rail head. Width between housings 61".
- 5" bar, 30" travel, 25 h.p. boring side head.
- Maximum width between side head spindle noses 53½".
- Maximum height between table top and rail head spindle nose 52".
- 18 spindle speeds—10—500 r.p.m.
- Cable feed range ½"—200" per minute.
- Head feed range ¼"—100" per minute.
- Phase I spacesetter, railhead, sidehead and table.

on display — Booth 1350

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ELDORADO GUN DRILL

DRILL HOLES

more economically...more efficiently, with controlled surface finish.

Drill straight, round, accurately finished holes at high speeds...through solids, blow-holes, hard spots and across-holes, in one single operation.

If you are now using gun drills, it will pay to find out how ELDORADO can cut your costs, give you improved hole finish. Chances are there's an ELDORADO Gun Drill in stock for you. Avail yourself of ELDORADO's experience and research facilities to answer your 'hole' problem.

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Sizes	.1250" to 2" dia.	1/8" to 1/2" dia. in 64ths	1/2" to 1/4" dia. in 32nds
OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2 3/4" long	1" dia. x 2 3/4" long
Tips	Carbide	Carbide	Carbide
Now, order from stock, or send in your specifications for a prompt quotation.			

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(continued on page 399)

"I've worked it out, and so far it's cost them $750 to decide whether to bore that 1/16 inch hole before or after assembly."

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1960 MACHINE TOOL EXPOSITION
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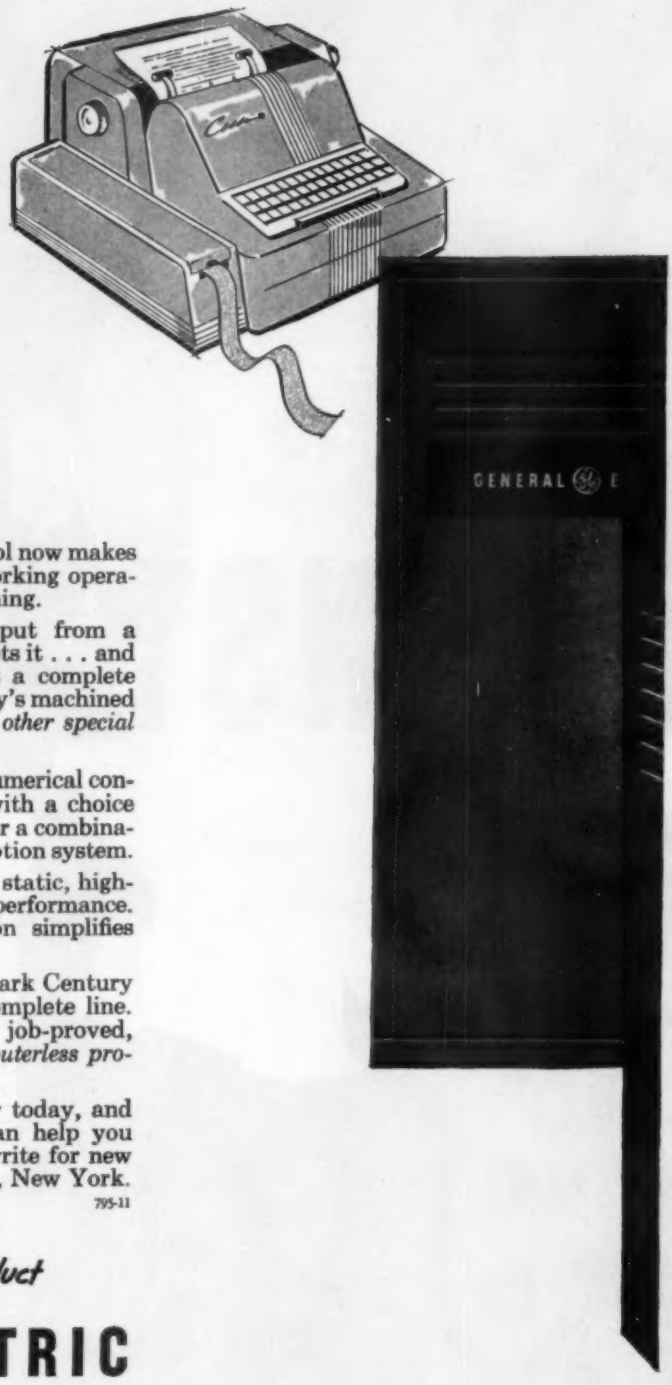
NOW...

automatic contouring without a computer



New General Electric Mark Century numerical control now makes *computerless programming* a reality for most metalworking operations . . . including all radial and straight-line machining.

This new control system takes punched-tape input from a standard automatic typewriter . . . reads and interprets it . . . and automatically commands the machine to carry out a complete machining cycle. Producing more than 85% of industry's machined parts can be as simple as that—*with no computer or other special equipment necessary!*

Contouring or absolute positioning—Mark Century numerical control comes in a compact, "building-block" package with a choice of: positioning to absolute co-ordinates; contouring; or a combination of the two. Each is available as a 2-, 3-, 4-, or 5-motion system.

Solid-state devices, modular construction—Completely static, high-speed logic circuits mean long life and dependable performance. New General Electric plug-in, modular construction simplifies maintenance and inspection.

Another member of the G-E program control family—Mark Century control is the newest addition to General Electric's complete line. It supplements the industry-renowned Mark series of job-proved, low-cost numerical positioning control to bring *computerless programming* to America's metalworking industry.

See your machinery builder or G-E Sales Engineer today, and find out how General Electric numerical control can help you increase productivity and cut machining costs. Or, write for new bulletin to General Electric Company, Schenectady 5, New York. Specialty Control Dept., Waynesboro, Va. 795-11

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ONLY

GOSS *and* DELEEUW AUTOMATIC CHUCKERS *offer the 1-2-3 feature*

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.

The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

MMT-PE

Booth No. 348

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

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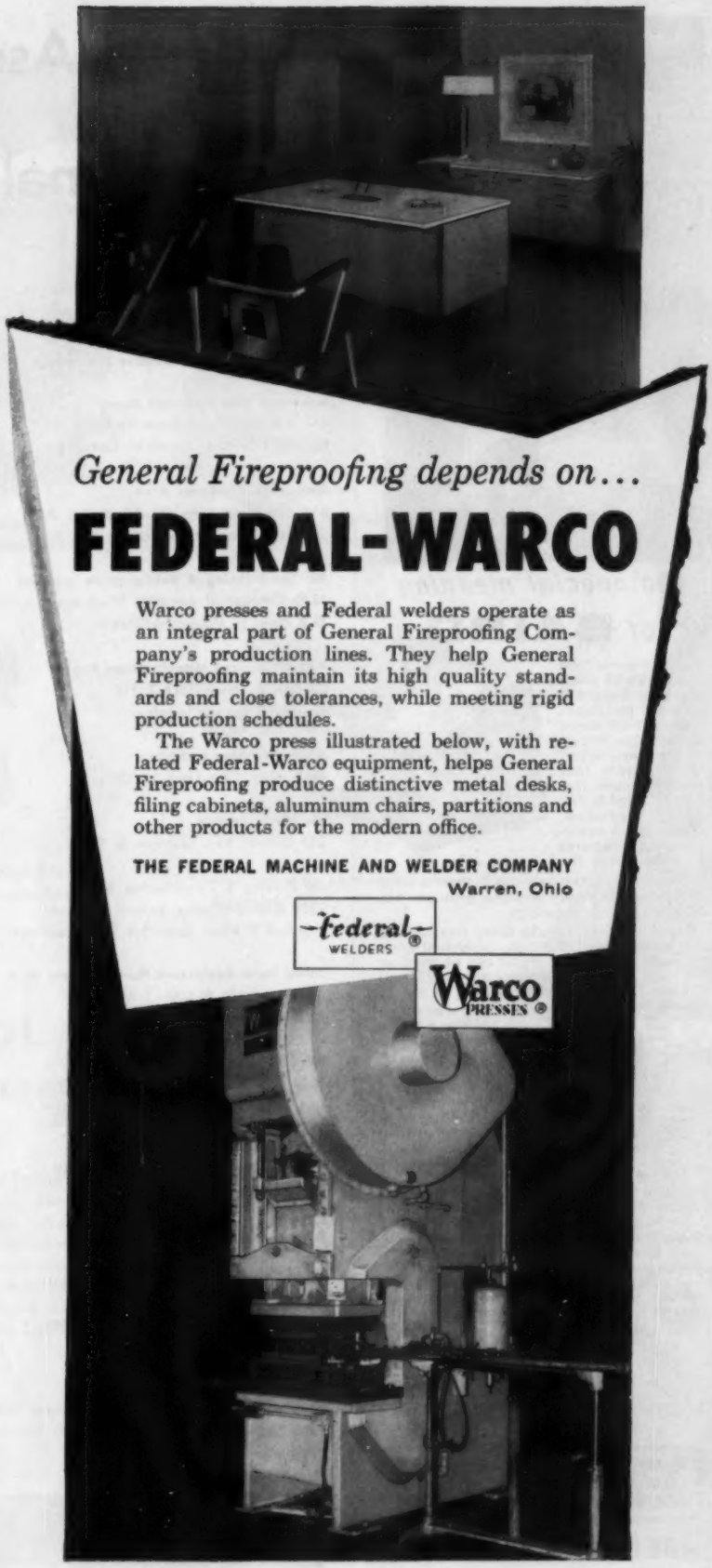
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You own a machine tool that's 15 years old. You bought it new or, perhaps, used. You need spare parts. You go to the manufacturer and learn that while that same machine, model is still being produced, there is no assurance that the parts you used will fit.

76H CHUCKER

This is one of the enigmas in the machine tool business today and the problem has its roots in quality control.

Here at Baird, unless there has been a complete model redesign, individual components on 1960 machines can be used on "sister" machines manufactured 25 and 30 years ago. Interchangeability is simply no problem.

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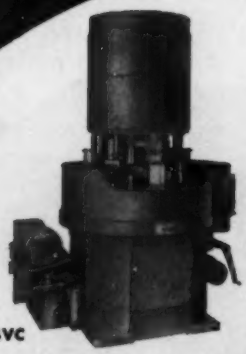

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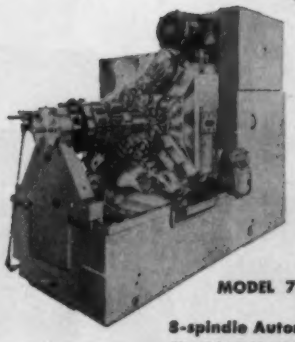
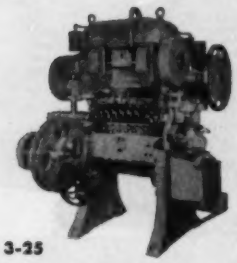
Vertical Continuous Lathe
Remarkable New Improvements!



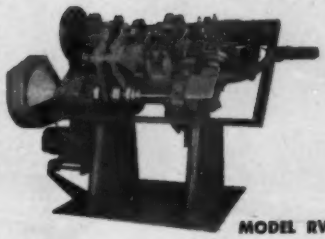
MODEL 78-H

8-spindle Automatic Multiple Chucking Machine
Important New Changes!



MODEL 3-25

Transfer Press for the High Production of Stamped and Drawn Parts
Many New Features!



MODEL RWI-1

Ribbon and Wire Inclinable Forming Machine
All New!

MACHINE TOOL EXPOSITION PREVIEW

BETTER STOP AT BAIRD BOOTH 1142

Your visit to the Machine Tool Builders' Show will not be complete if you miss the opportunity of seeing these 4 Baird high production performers in actual operation. The just-introduced RWI-1 represents the most startling innovation in ribbon and wire forming machinery in years ... important new design changes highlight the well-known Baird Transfer Presses, Chuckers and Vertical Continuous Lathes. We have a few surprises waiting for you, too!

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Builders of High Production Machinery since 1846

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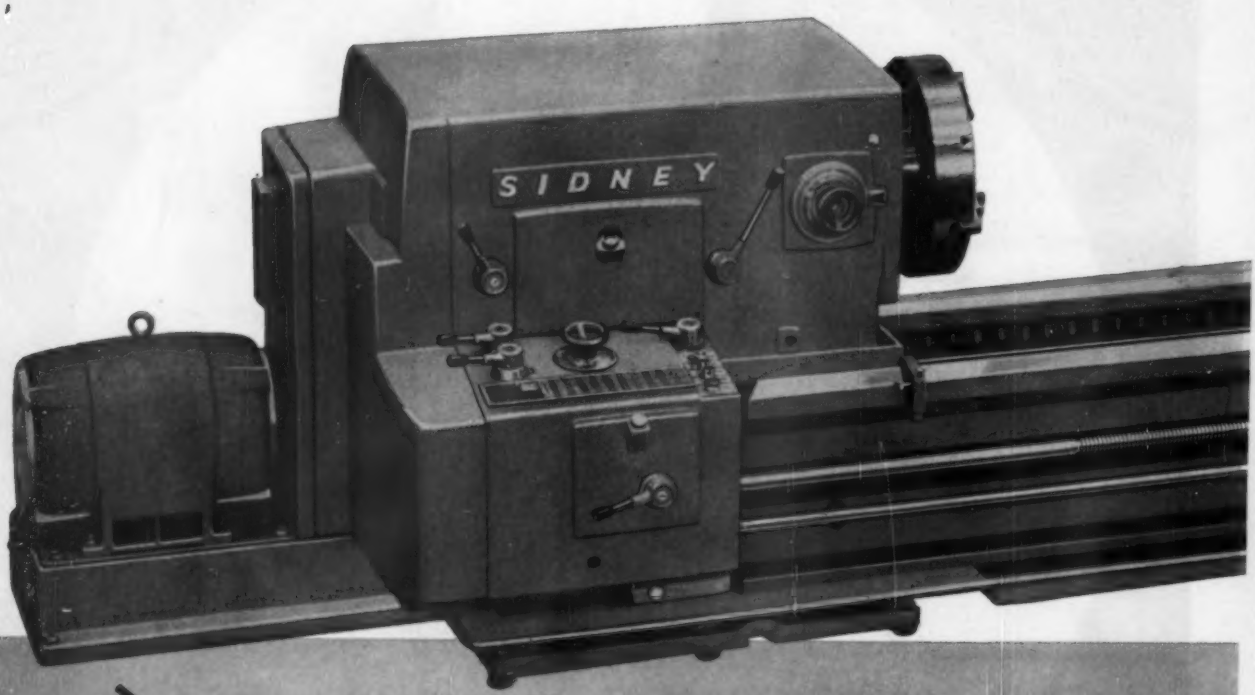
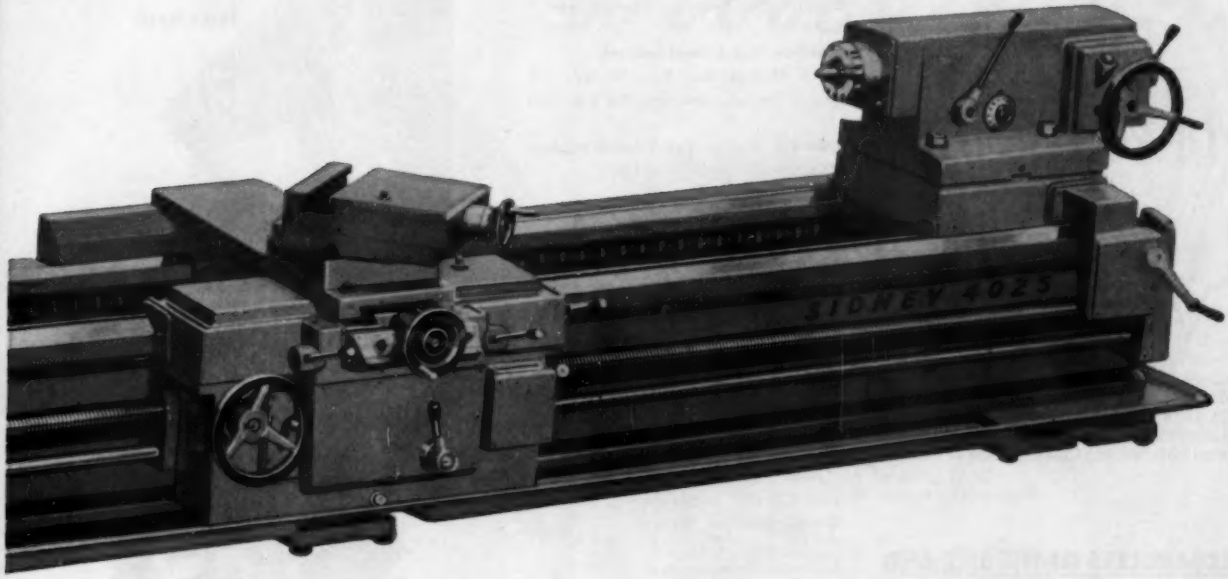


all-new SIDNEY 4025

GETS new GLORY



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SPEED RANGE OF 5 TO 800 R.P.M. permits the selection of a surface speed to handle a larger variety of work or materials. The Sidney 4025 can achieve a 22 to 26 micro inch surface finish.

SIMPLIFIED CONTROLS located at a convenient height for the operator provide faster, easier operation. Spindle controls consist of a single dial and shifting lever for either r.p.m. or surface speeds.

DUAL CAM TUMBLER LOCK FOR GEARBOX eliminates the possibility of gear and cone gear unlocking during exceptionally heavy feeds. Gearbox also provides 60 threads and feeds for greater versatility.

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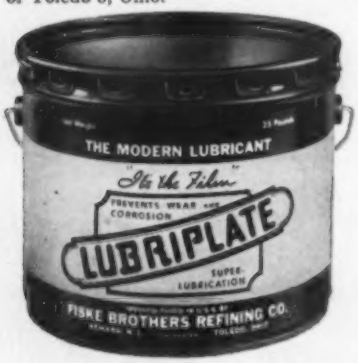

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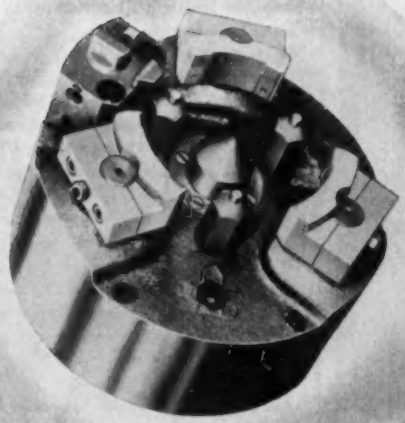
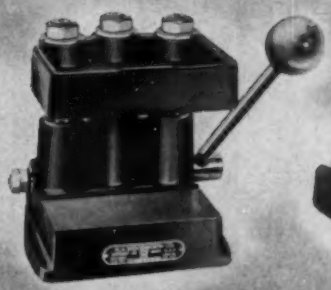
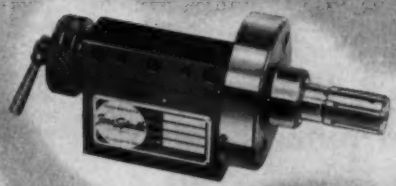


"BALL-LOK"
POWER CHUCKS

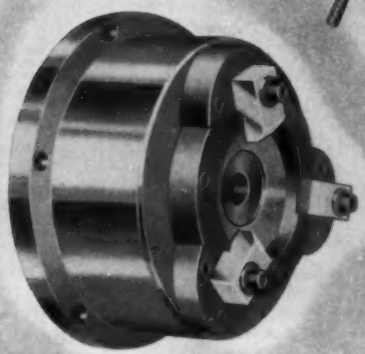


"CONE-LOK" JIGS

"TORK-LOK"
FIXTURES

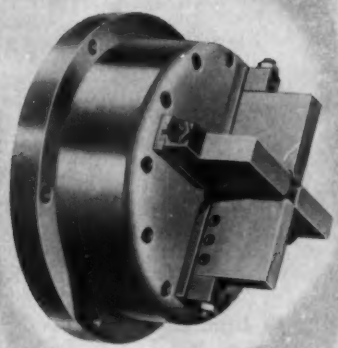


"ZERO-SPINDLE"
INSPECTION FIXTURES



UNIVERSAL CLAMPING FIXTURES
(Finger Chucks)

"TORK-LOK"
COLLET ARBORS



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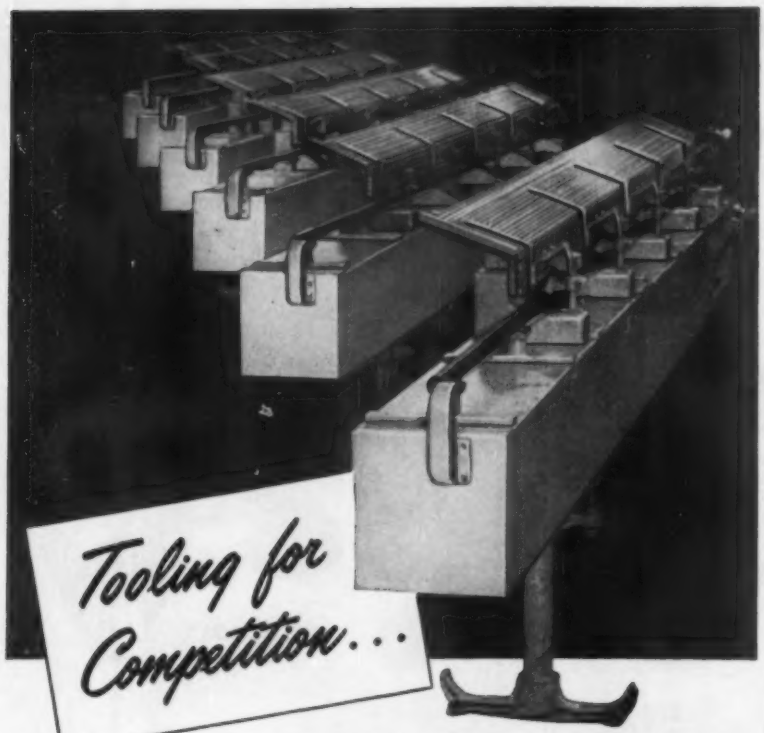

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"Sure, that's right—I did estimate it'd take two hours—but that was before I dropped the motor."

In a delivery to the U. S. Steel Gary works, the temperature of the grease was 25°F. Still, 22,860 lbs. of grease were pumped to the storage tanks in 65 minutes, with a pressure of 100 psi.

Cities Service Announces

REVOLUTIONARY CONCEPT IN BULK GREASE HANDLING

Until now the standard container for shipping and handling industrial greases has been the 400 lb. drum. For companies using large quantities of grease, these drums present such problems as: cost of storage and multiple handling—full and empty; up to 10% residuary waste; and the necessary cost of the drums themselves.

Cities Service, in cooperation with DuBois Engineering and Manufacturing Corp., recently embarked upon a program to develop a system for delivering grease in bulk from "the grease kettle to the bearing." The result is a tractor-trailer unit with two 12,000 lb. capacity containers. A gear-type pump on the truck transfers the entire load to the customer's stationary central storage containers in less than an hour. This system revolutionizes the concept of grease handling for companies using centralized systems.

The new Cities Service bulk-delivery truck is presently operating in the mid-west states with plans for expanding this service to other areas.

If you are a bulk grease user, the time and money this system can save you are well worth looking into. For the full story, call your local Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Ill.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Longer wearing MILLIONTHS

Time you got acquainted with the world's first* and finest gage blocks. Blocks possessing correct temperature coefficient—absolute metallurgical stability. Blocks with a positive built-in wear factor—unconditionally guaranteed to be minus nothing from nominal size. Blocks, too, that feature chromium plated gaging surfaces to give you longer wearing millionths and lower gaging costs. Yes, it's time now to buy a set of

ELLSTROM CHROMIUM PLATED GAGE BLOCKS

MANUFACTURED AND CALIBRATED TO THE INTERNATIONAL INCH—EXACTLY EQUAL TO 25.4 MILLIMETERS

"W" Working Accuracy: +.000008"/−.000000"
Parallelism: .000004" / Flatness: .000004"
"I" Inspection Accuracy: +.000004"/−.000000"
Parallelism: .000003" / Flatness: .000003"
"L" Laboratory Accuracy: +.000002"/−.000000"
Parallelism: .000001" / Flatness: .000001"

Above: Ellstrom Rectangular Set No. 92-R. Right: Ellstrom Square Set No. 81-SA, with accessories.

New Catalog contains prices and specifications—send for it today!

ELLSTROM STANDARDS DIVISION
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DEARBORN GAGE COMPANY
Dearborn, Michigan
Originators of Chromium Plated Gage Blocks

*Ellstrom—*Measuring in millionths for three generations*

Hjalmar Ellstrom (1863-1942)—He gave mankind the key to mass production of interchangeable parts. For it was he alone who conceived and produced the world's first combination gage blocks—the first master reference standards accurate to the infinitesimal millionth part of an inch!

CIRCLE 638 READER SERVICE CARD

WE'D LIKE YOU TO VISIT US . . .

. . . during the 1960 Chicago Exposition

AM/MM will have two booths at the big Chicago show: Booth 1548, Upper North Hall, International Amphitheater and Booth 131, North Hall, Chicago Navy Pier. Both have interesting and informative exhibits and we hope you'll stop and visit our staff members in attendance.

American Machinist/Metalworking Manufacturing at the 1960 Chicago Exposition — September 6-16

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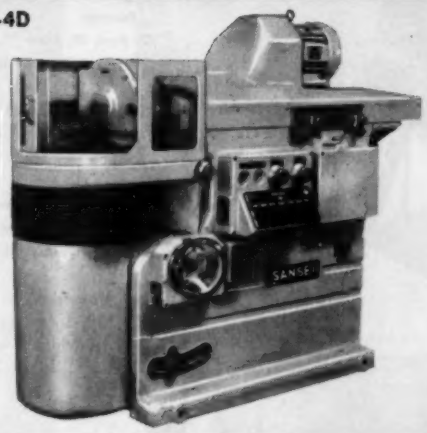

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COMPARE THESE FEATURES WITH ANY AVAILABLE!

- Coordinated table rotation and ram feed for constant grinding speeds at any position.
- Fully hydraulic operation of work table and grinding head assure vibration-free, trouble-free, accurate work.
- Flawlessly designed Centrifugal Coolant System assures minimum heat generation and drastically reduces wheel loading.
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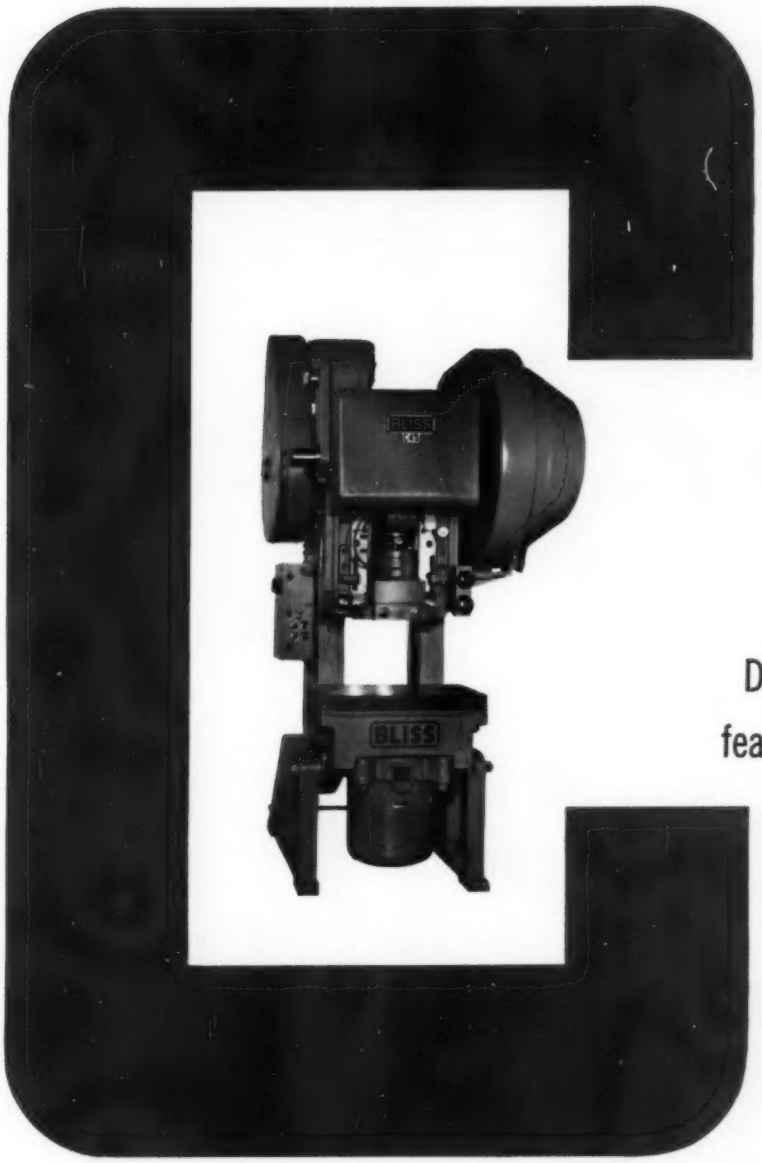
(continued on page 414)

"They can get as excited over this as we get over a new bicycle!"

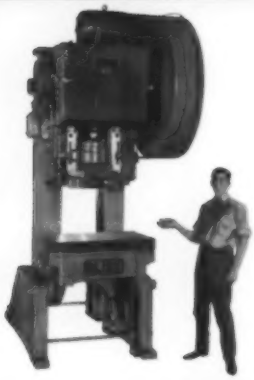
NEW!

Bliss "C" Series Inclinable Presses



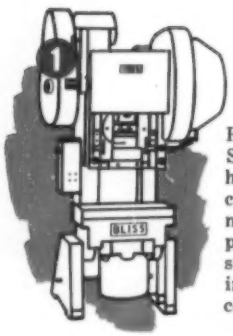
Dollar for dollar...
feature for feature...
the
finest
inclinable you
can buy

to learn why, simply turn the page...



New Bliss "C" Series:

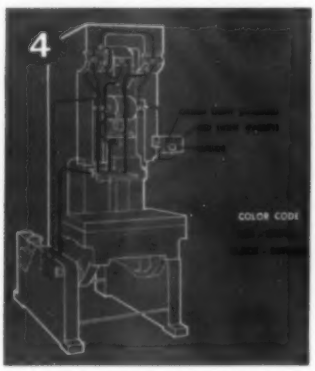
more press, dollar for dollar, than any inclinable ever designed



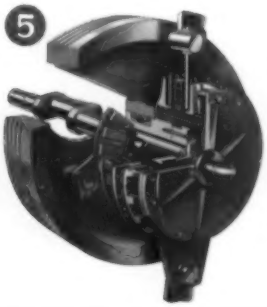
RUGGED NEW FRAME . . . Sturdiest ever in Bliss' inclinable history. Deflection and vibration are cut to a minimum, providing maximum die life and uniformity of parts. Every working part has strength to match, so that each "C" inclinable develops tonnages in excess of JIC specifications.

MORE DIE SPACE THAN EVER BEFORE . . . Lengthened slide adjustment and larger openings in the bed and between the uprights provide the roomiest die area ever offered in a Bliss inclinable.

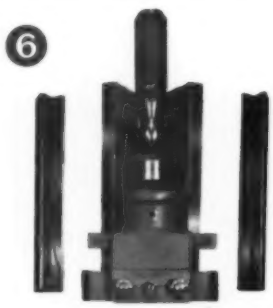
HEAVIER CRANKSHAFT . . . Crankshafts on the "C" series (top) are large, having as much as 25% to 30% greater diameter at the crankpin. Precision-forged from SAE 1045 steel, all "C" series crankshafts are normalized to withstand shock under load, then machined and finish-ground to a tolerance of ±0.002".



RECIRCULATING OIL LUBRICATION . . . You can specify a fully automatic recirculating system on your new "C" inclinable. If you prefer, your press can be supplied with a reliable "Bijur" system, or job-proven Bliss manual system which is supplied as "standard" equipment.



CHOICE OF CLUTCHES . . . Bliss Type CK Combination Air Friction Clutch and Brake, which has proven its single-tripping ability, or the Bliss Rolling Key Clutch, the most dependable positive clutch ever developed for power presses.



BALL-TYPE CONNECTION LAMINATED BRONZE GIBS . . . Every "C" inclinable has the famous Bliss ball-type connection screw, proved in thousands of plants. Laminated bronze gibs provide maximum resistance to wear, prolong service life.

Learn more about the clean, modern looking Bliss "C" series inclinable presses. Our just-published brochure gives all the specifications. Send for it today.

MMT-PE Booth 1325

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RED RING PRECISION GEAR HONER

Smaller

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Precision Operation In A Compact Design . . . Cuts Costs

LINLEY
JIG BORERS

Designed specifically for tool, model and experimental departments.

The Linley Jig Borer is accurate to a high degree. It is fast to set up and position and has the versatility required for precision tool room and die work, yet is low in cost.

Many time-saving accessories are now available for use with the improved Linley that add to its usefulness and simplify its operation.

Check on the many advantages of this improved jig borer. Table size is 7" x 17½"; table travel, 6½" x 10".

Send for descriptive literature.

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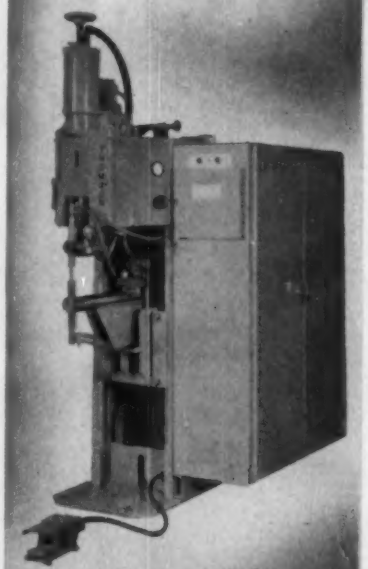
(continued on page 421)

"Can I be first—I'm left over from last Friday!"

The finest
RESISTANCE
Welders
— competitively priced!



THOMSON manufacturing capabilities have resulted in reduced costs on their resistance welding machines of long recognized quality . . .

SPOT	**PRESS**
PROJECTION	**FLASH-BUTT**
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For all **AUTOMATED** and **HIGH-PRODUCTION** requirements — either special or standard design — **THOMSON QUALITY** is within your budget. A quote from **THOMSON** will show you how.

Look for our nearest representative in the yellow pages or contact —

Inventors of Resistance Welding
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Bill:

Be sure to see the New Reed high speed general purpose thread rolling machine also their new spline rolling and gear burnishing machine

Booth 421 Chicago Exposition

IN OPERATION AT BOOTH 421

B130—Producing ⅜"-11 cap screws up to 200 per minute.

A425—Rolling spline on automotive transmission shaft.

B111—Thru-feed rolling ¼-20 bars.

A22—Hand feeding small lot run on heat treated parts.

NEW MACHINES BY REED

B150—Large In-feed Thread Rolling Machine—5" Capacity

B910—General Purpose High Speed Thread Rolling Machine —1" Capacity

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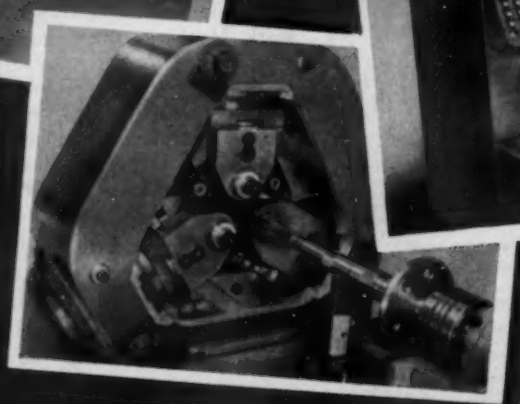
A25—Simplified, Rugged, Thru-feed Thread Rolling Machine—2½" Capacity

A425—Involute Spline and Serration Rolling, and Gear Burnishing Machine—2½" Capacity



A425
Rolling Spline on Automotive Transmission Shaft

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

HOLDEN, MASSACHUSETTS, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

Booth 421
Machine Tool Exposition
September 6-16, 1960

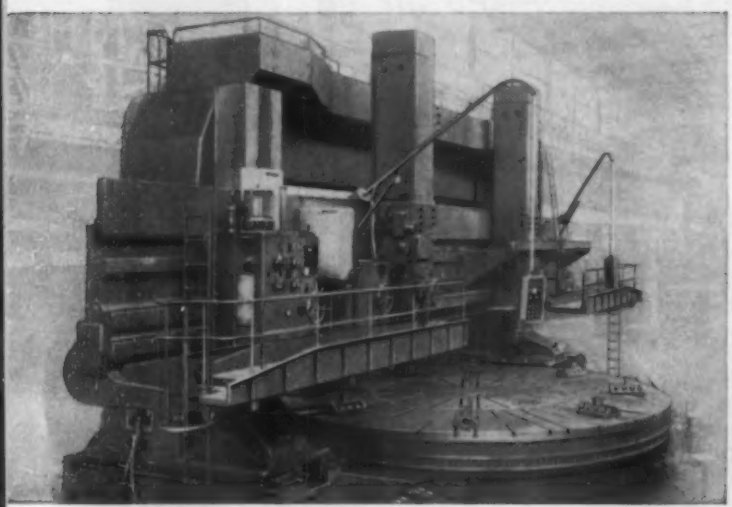
watch these giant workers chip away costs!

This 8¾ in. SCHIESS model BF horizontal boring and milling machine...
now completely redesigned with many innovations. Here are a few...

Two individual drives—gear-drive for roughing, belt-drive for finishing. Belt-drive particularly suited to high-speed machining with carbide tools. New tool clamping device—does away with draw keys, hammers, drifts and binding screws. All spindle-slide movements controlled from easily accessible operating platform (or from pendant station or portable control panel, if desired). Special main-drive belt requires no readjusting. Column, spindle-slide and boring spindle may be adjusted at rapid traverse.

Spindle diameters, 6-5/16″ to 8-7/8″. Maximum diameter bored, 59″—faced, 79″.

It takes Europe's largest builder of heavy machine tools, Schiess, to turn out giants like these. Parts and service as close as Pittsburgh. And an American Schiess engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all Schiess BF and K models.



This 32 ft. SCHIESS model GK vertical boring and turning mill...
Look at all these new features of the most modern vertical boring mill of its type: Two ram heads on the rail, one of which is tracer-controlled. One milling head on the rail which can be parked on the left side rail extension. Dual tables—one 15′ table on the inside, a 32′ table on the outside. Each table has independent drive, or both tables can be used together and synchronized as one. Table equipped with indexing device to be used for indexing layout work. Machine will swing a maximum diameter of 40′. Rapid traverse motions with pushbutton control of changeover from feed motion to independent power traverse. Electro-mechanical locking of cross-rail to columns. Fingertip speed control—counter-balanced cross-rail and side-head—completely enclosed swiveling octagon rams—pendant control—automatic lubrication.

Have you ever seen anything like it?

For more data, circle number 667 on inquiry card

SCHIESS

AMERICAN SCHIESS CORPORATION

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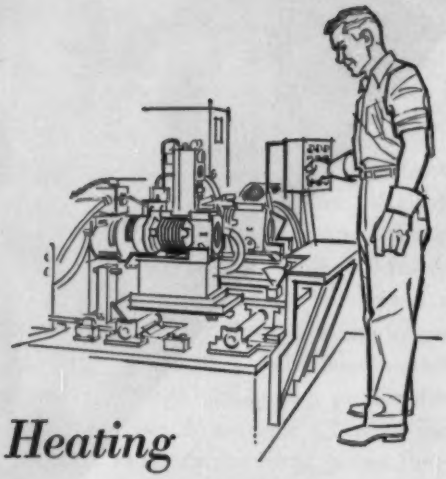
CIRCLE 667 READER SERVICE CARD

How a **Shrink-Fit** E-x-p-a-n-d-s Profits

Copeland Saves $100,000.00 A Year



with TOCCO* *Induction Heating*

Press-Fit Method

In the assembly of motor-compressors for their air conditioning and refrigeration products, Copeland Refrigeration Corporation formerly employed air presses for force-fitting their 1/5 HP through 1½ HP motor housings and stators. This method was costing Copeland $100,000.00 annually in labor, material and quality control expense to maintain the high quality of its product.

TOCCO Shrink-Fit Method

To reduce these costs, Copeland installed a 30 kw, 10,000 cycle TOCCO Induction Heating Unit. Motor housings are heated to 400° F. resulting in up to .013" expansion. After cooling, the motor housing shrinks to form a predictable and perfect fit with the stator. Stator scoring and distortion are eliminated and $100,000.00 annual saving realized.

Whether your production problem is shrink-fitting or higher temperature applications such as brazing, heat-treating, forging or melting, look to TOCCO for an economical solution to any metal-heating problem.

THE OHIO CRANKSHAFT COMPANY

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Please send copy of "Typical Results of TOCCO Induction Heating—Principles, Applications, Equipment."

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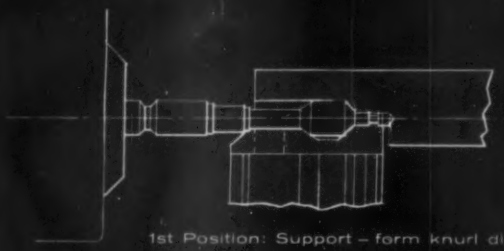
Acme-Gridley Speed & Accuracy...

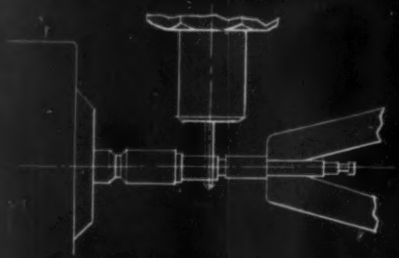
SLASHES TOTAL MACHINE TIME 76.4%

for E. F. Johnson Company

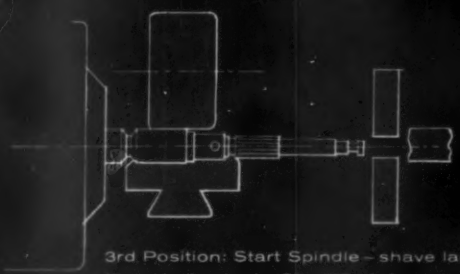
6th Position: Turn .075 dia. – form .165 and .198 dias. – mark for cut-off – support



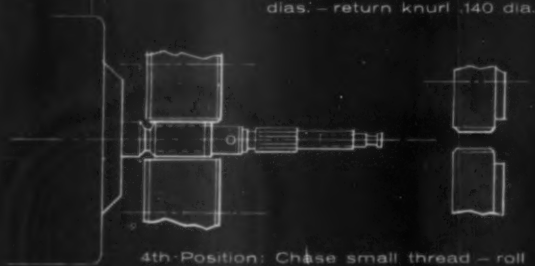
1st Position: Support – form knurl dia., .055 and .075 dias.



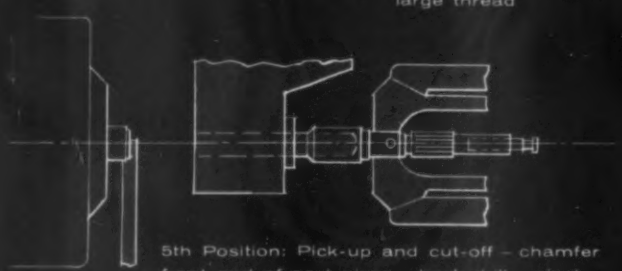
2nd Position: Stop spindle – cross drill – hollow-mill small thread dia.



3rd Position: Start Spindle – shave large thread dia. and .198, .165, .140 and .130 dias. – return knurl .140 dia. face end



4th Position: Chase small thread – roll large thread

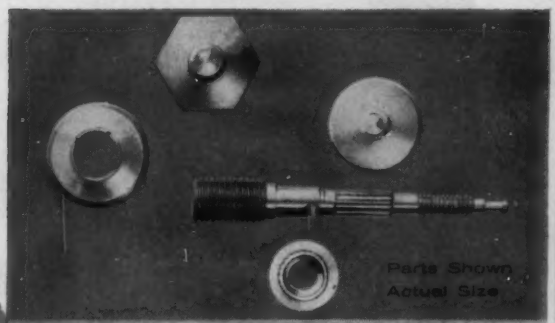


5th Position: Pick-up and cut-off – chamfer front end of next piece – back drill – eject – chamfer front end

Total Machine Time – 5 Seconds

. . . also . . . cost-per-piece is substantially reduced . . . part uniformity and quality definitely improved . . . scrappage all but eliminated.

This is the *record* of two Acme-Gridley 7/16" RA-6 Spindle Bar Automatics installed at the E. F. Johnson Company, Waseca, Minnesota. Producing some 15 intricate parts, like those shown, the rugged and versatile Acme-Gridleys continually meet the rigid specs of this well-known manufacturer; help make high quality products such as the Viking Messenger Citizen's Band two-way radio available at prices that fit the public's pocketbook.



See this job in operation at the Machine Tool Exposition...Booth #781

Tangible production savings, like those realized by E. F. Johnson, are assured with Acme-Gridleys. In your plant, the 7/16" RA-6, or any of the world's most complete line of multiple-spindle automatic bar and chucking machines will show you a new dimension in mass production efficiency.

National Acme

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171 E. 131st Street
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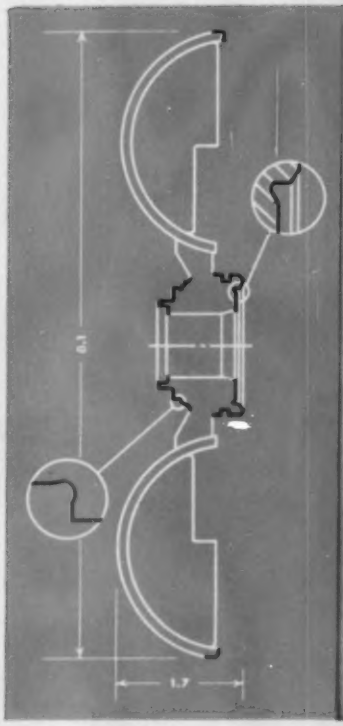
Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

Announcing the

NEW OLOFSSON MODEL 41, AIR-OPERATED CAM-CONTROLLED MACHINE



***Part:* TORUS**

Operations Performed:
Facing, chamfering, boring, undercutting and grooving.

Rate of Production:
170 pieces per hou *(at 80% efficiency).*

ONE MACHINE FOR EACH SIDE OF PART. TWO SPINDLES PER MACHINE.

Bores, Turns, Contours and Faces with new efficiency and economy

Designed for generating accurate contours mechanically, the Olofsson Model 41 brings new efficiency and economy to boring, turning, contouring and facing operations like those diagrammed above. Its low height to width ratio of spindles to ways provides maximum stability and smoothness to *repetitive* machining operations. And, on multiple operations it is necessary to check just one dimension from each tool used, all other dimensions will be in relation.

The cam-controlled stroke is 4" on both main and cross slides. Cams are mounted on the same shaft, and both table slide and cross slide are in *direct contact* with their respective cam. No linkage is involved. Both cams and cam followers are completely submerged in oil; can be quickly and easily changed.

All machine functions are electrically interlocked. Air power supply is from 70 p. s. i., minimum.

Your Olofsson representative will be glad to suggest profitable applications for your operation. Call him, or contact Olofsson *in Lansing.*

Descriptive literature on the Model 41 is yours for the asking. Write today.

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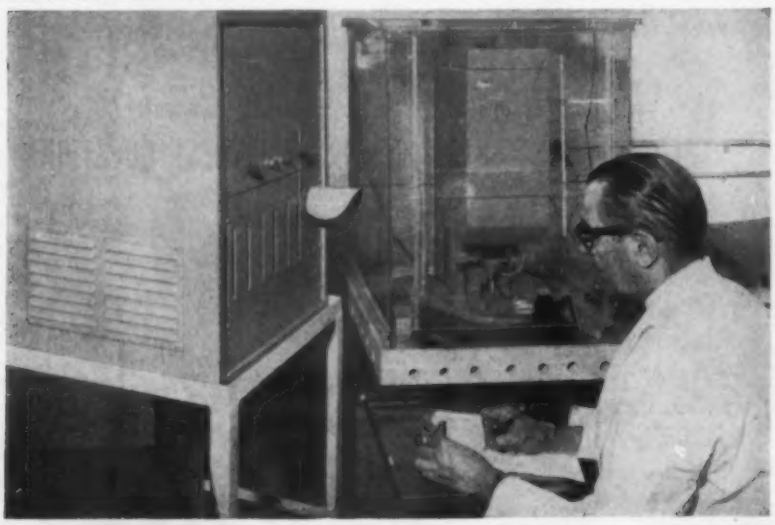

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(continued on page 426)

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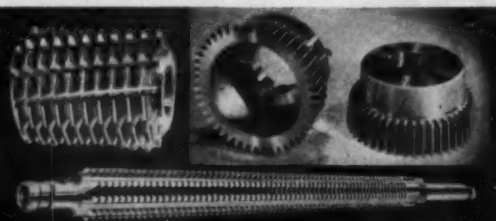

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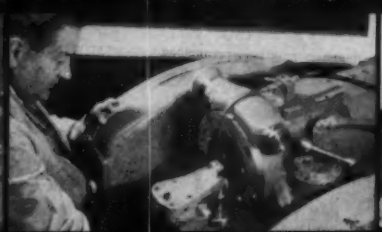

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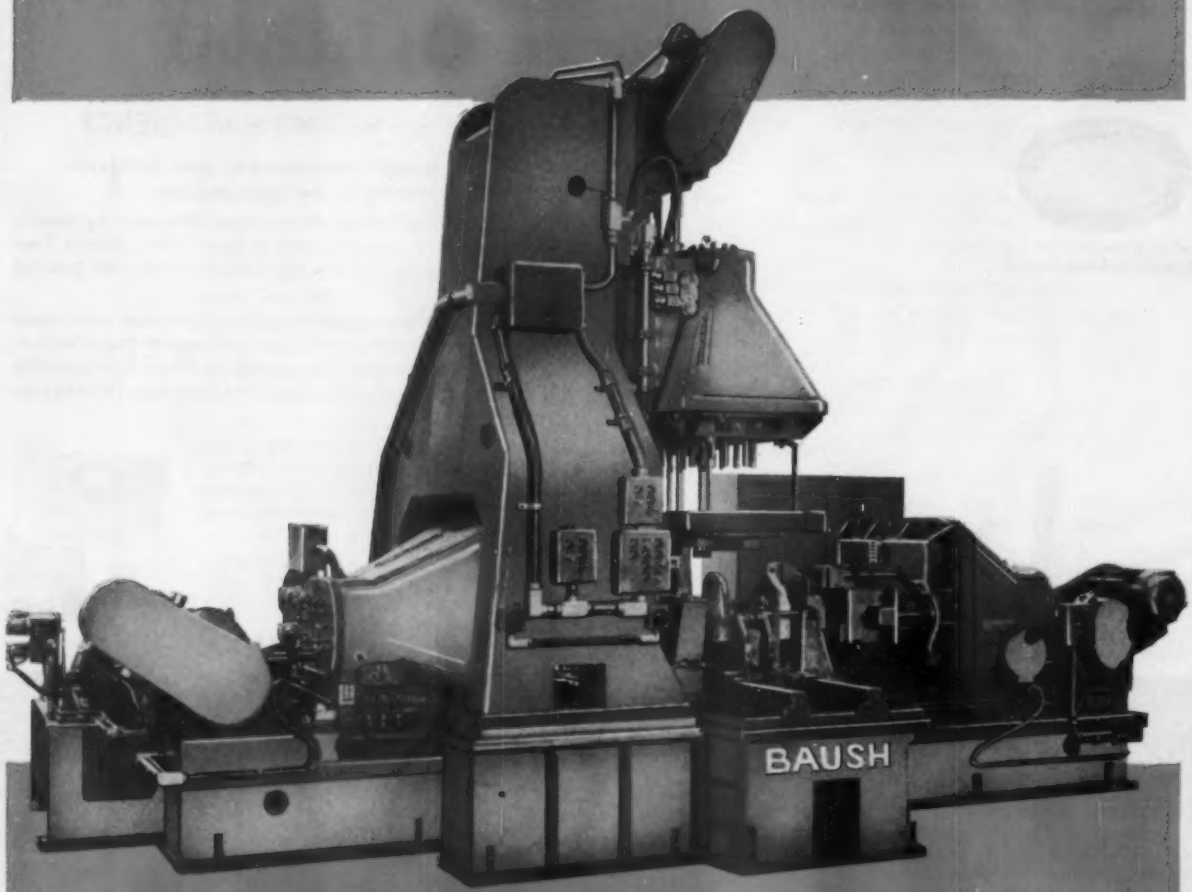
SPECIAL 3-WAY "H-15" AUTOMATIC HYDRAULIC

WITH MULTI-SPINDLES FOR DRILLING AND REAMING TRACTOR PARTS



Baush specifically designed this single purpose machine to speed production for a leading tractor manufacturer. This "H-15" is unique in that by changing the hydraulic unit to a recirculating ball screw the machine becomes a 100% mechanical leadscrew machine.

Three 20" x 30" heads are bored and furnished with 24 spindle pinions, and all spindles are arranged for two (2) speeds and a neutral position. The heads have master-bored cluster plates with a total of 35 slip-sleeve spindles for drilling or reaming.

As illustrated, this machine has automatic hydraulic operation of fixture and slide.

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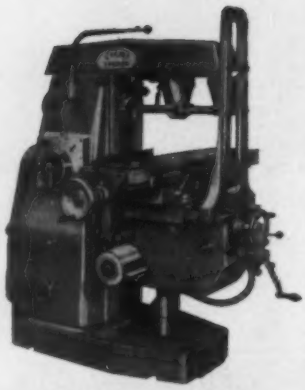

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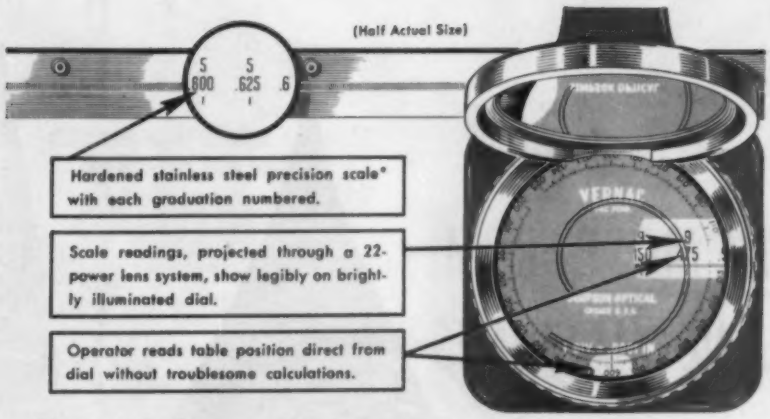
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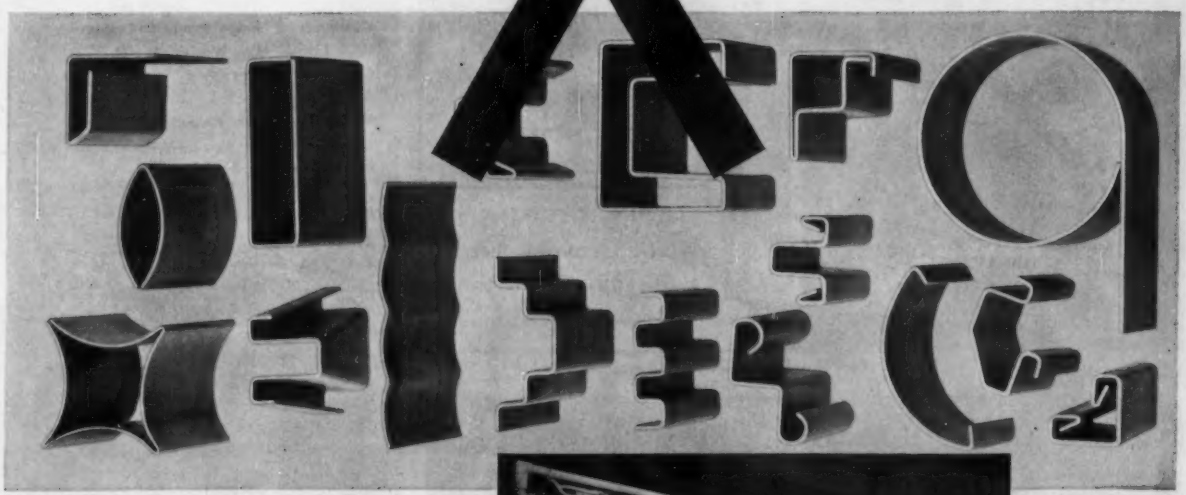

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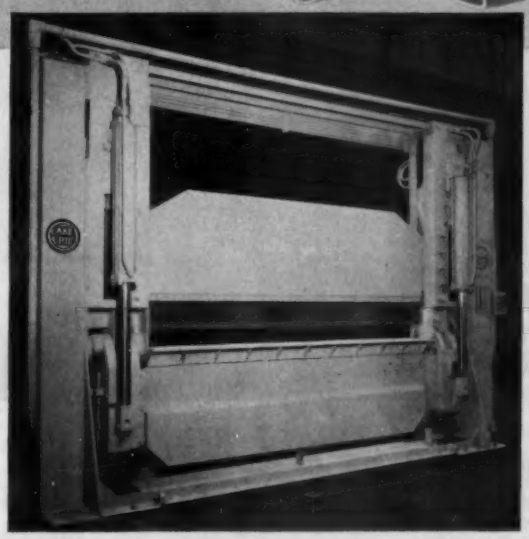

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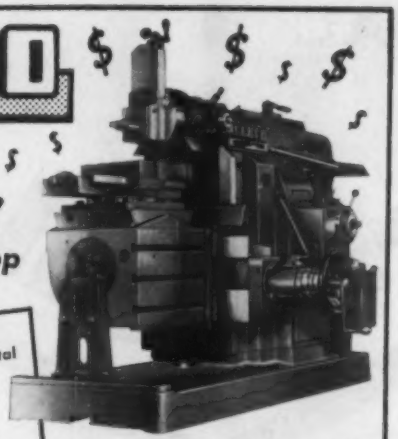

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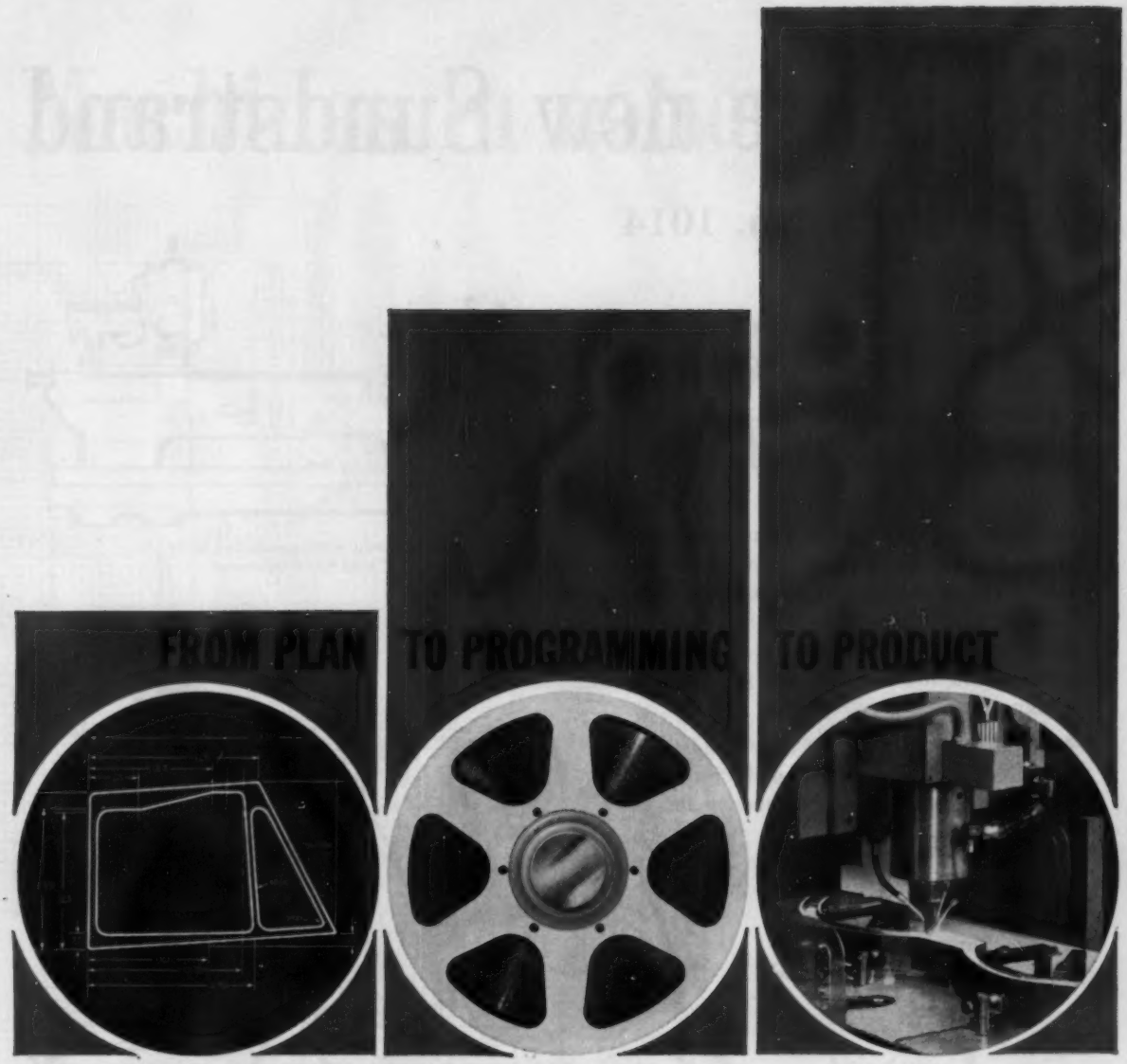
(continued on page 436)

"This is good; he's going to explain a job to old Joe that Joe doesn't want to understand . . ."



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Machine Tool Exposition,
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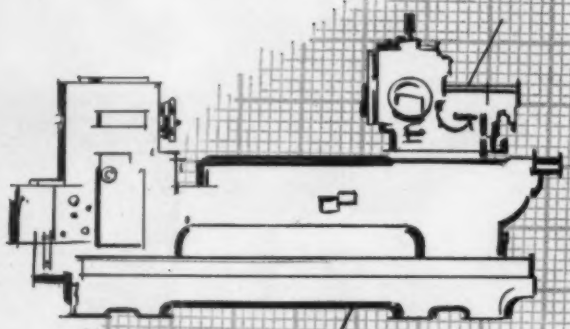

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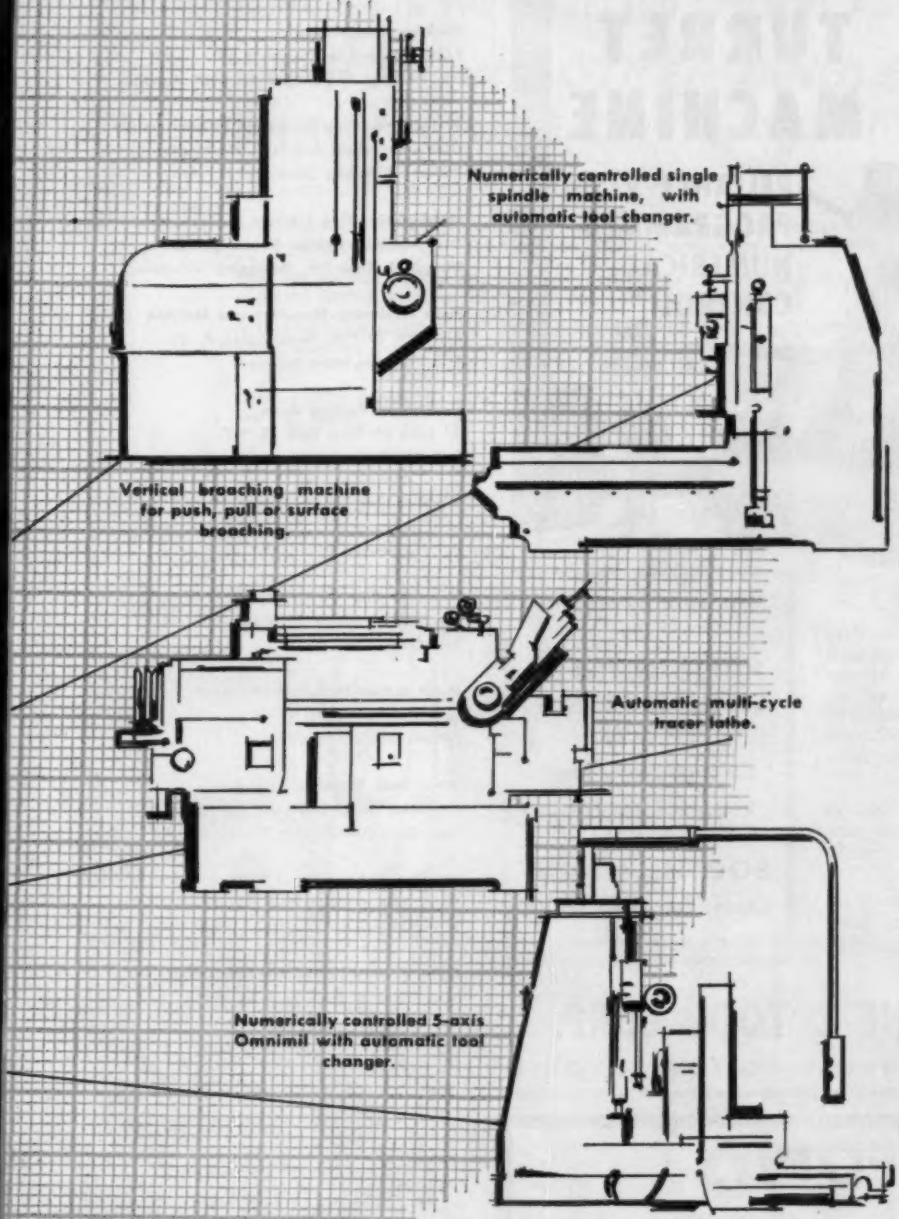
Numerically controlled single spindle machine, with automatic tool changer.
Vertical broaching machine for push, pull or surface broaching.
Automatic multi-cycle tracer lathe.
Numerically controlled 5-axis Omnimil with automatic tool changer.

1 Three axis numerically controlled vertical spindle machine with 20-position tool changer.

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3 Automatic universal thread-milling machine has simple dial setting . . . no cams to change.

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9 New centerless abrasive belt grinder, with micrometer infeed of regulating wheel, assures precision size control of work ¼" to 4½" diameter.

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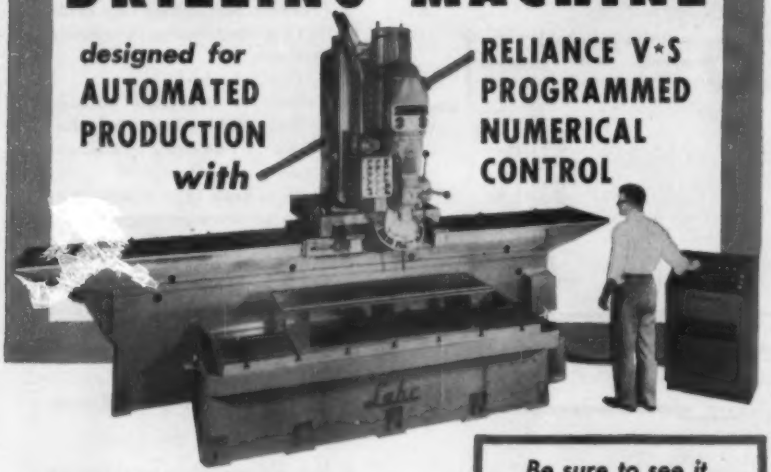

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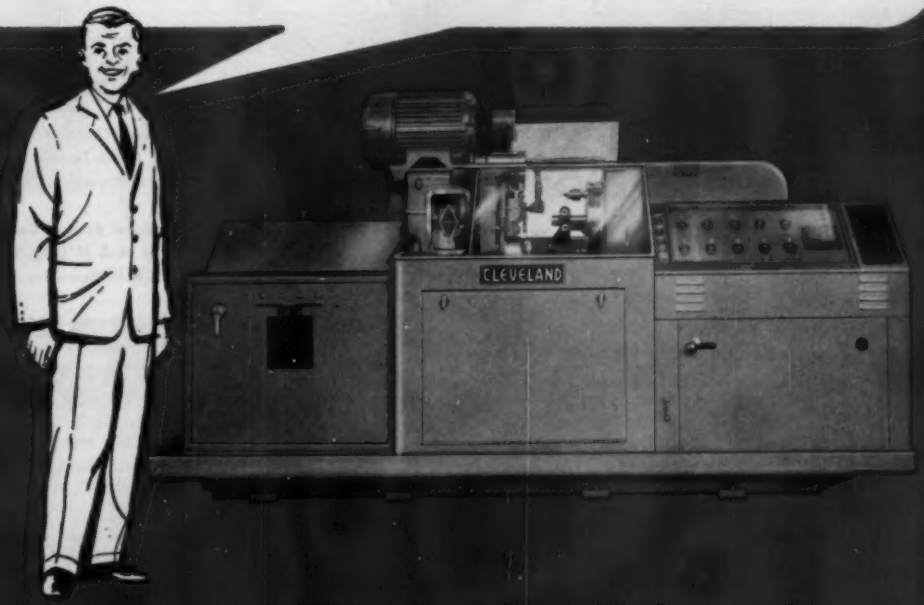

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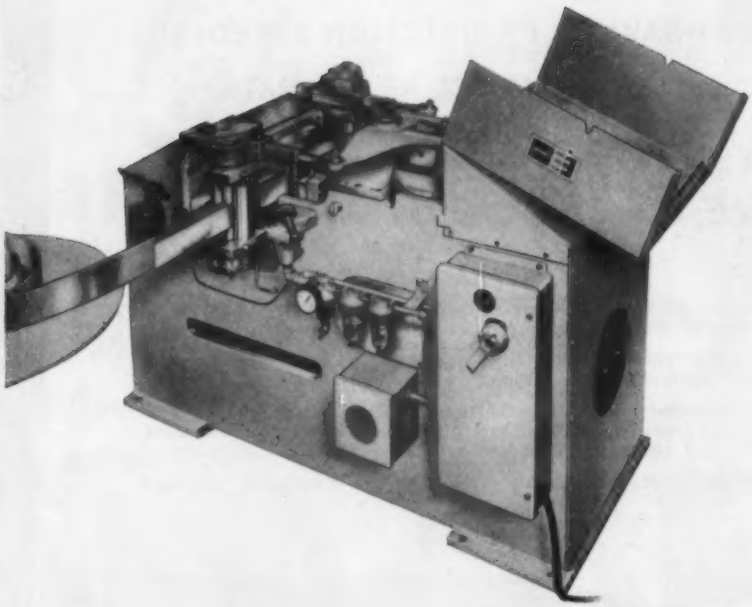

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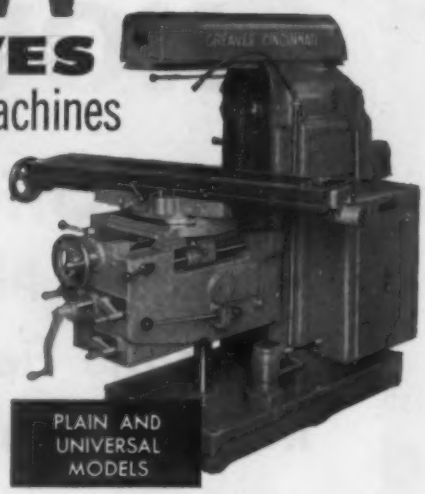

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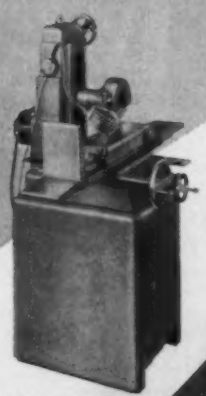

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THE CHALLENGER
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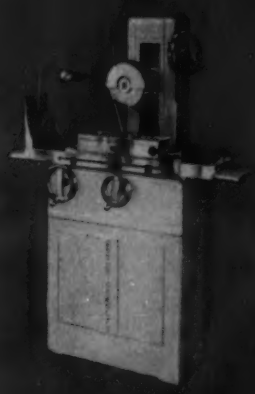

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(continued on page 447)

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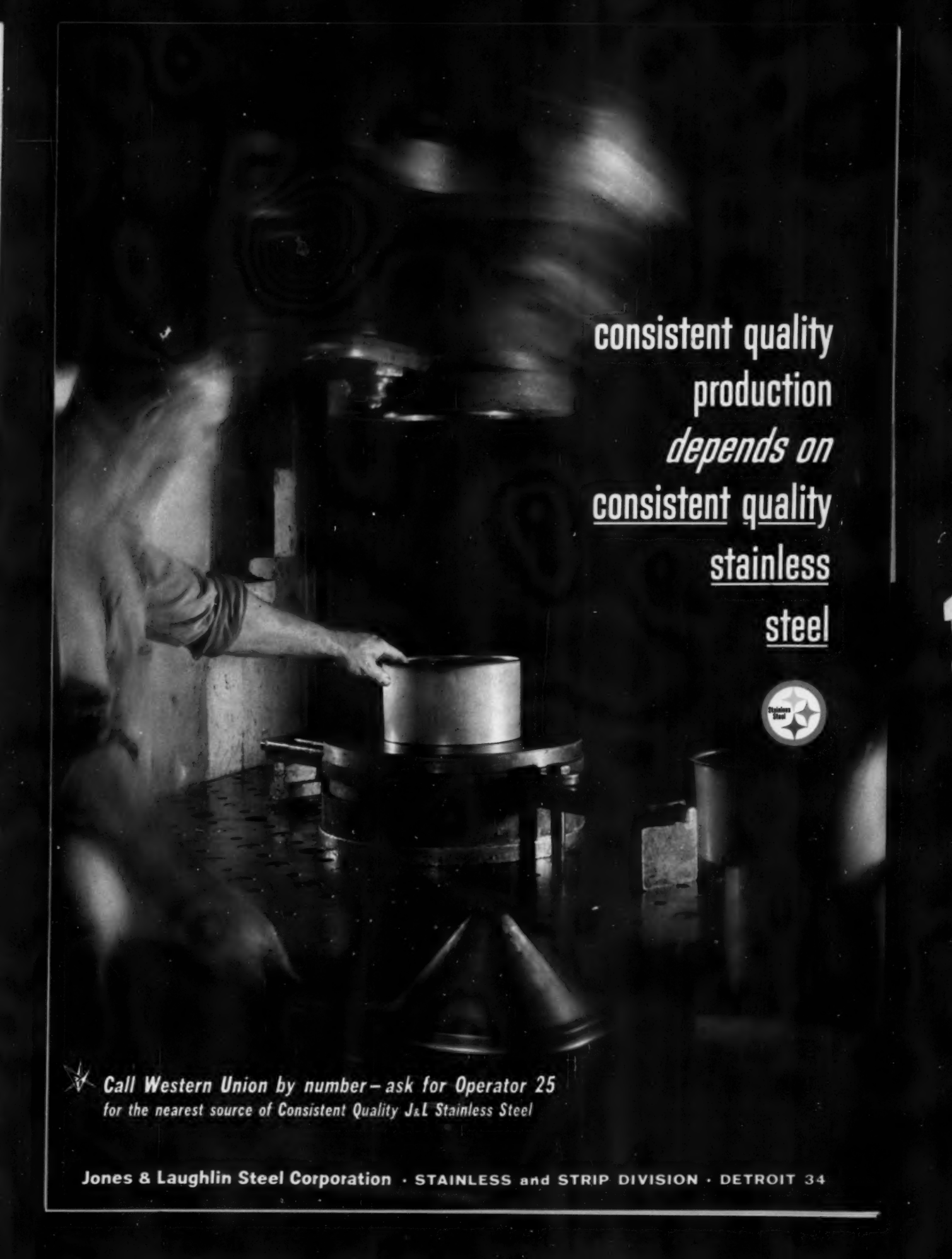

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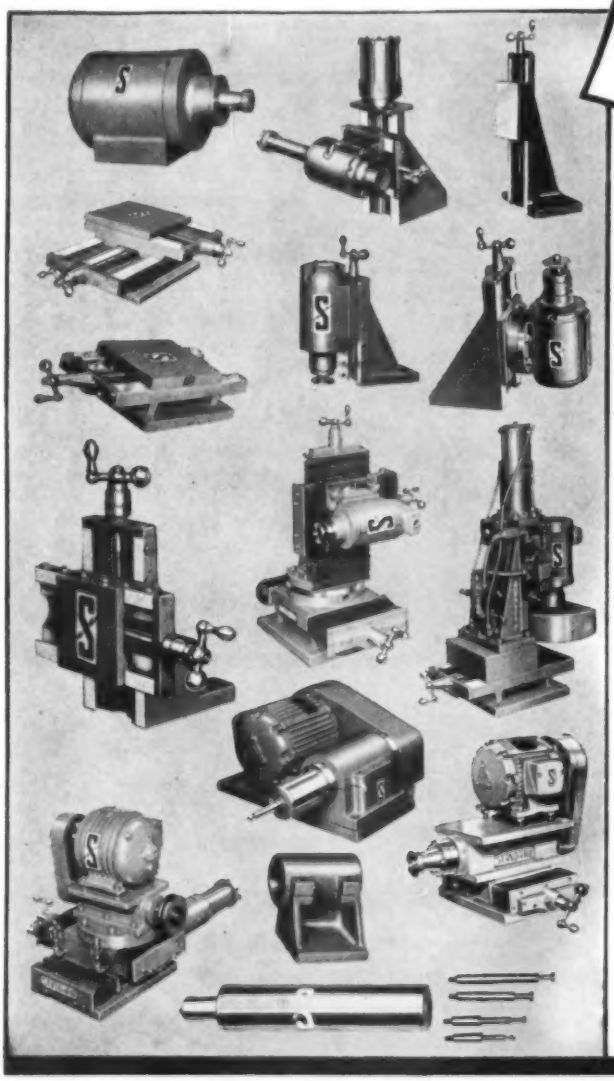
Jones & Laughlin Steel Corporation · STAINLESS and STRIP DIVISION · DETROIT 34

TINKER TALK

FOR THE SPECIAL MACHINE DESIGNER



"... fit part **A** (STANDARD SUPER PRECISION SPINDLE) to part **B** (STANDARD SLIDE, FEED OR TABLE) ..."

That's the Standard "Building Block" method of special machine design ... simple as that, a Standard Super Precision spindle to mill, drill, grind or bore the work ... coupled with the right Standard slides, feeds or swivels to either bring the spindle to the work or the other way 'round.

Recommended procedures:

1. Send for our new catalogue. It's filled with special machines we've built for design engineers — machines that have whipped ornery problems all over the nation.

2. Or, send us a rough sketch of the problem (or describe it). The chances are we've made one almost like the one you need. We'll send you back the "building block" answer.

BUT, DO IT TODAY!

SEE OUR CATALOG IN SWEET'S MACHINE TOOL CATALOGS OR WRITE FOR COPY

SPINDLE DIVISION

the STANDARD electrical tool co.

SUPER PRECISION SPINDLES AND MACHINE TOOLS

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Sept. 6-16
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(continued on page 450)

"No rush on this job, boys—work all night if necessary."

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Automatic NUT TAPPER

Taps nuts and screw machine parts automatically to close tolerances. Produces smooth, clean threads square to nut bearing surface. Maintains high production with minimum tapwear. Safety devices prevent tap breakage. Complete information available on request.

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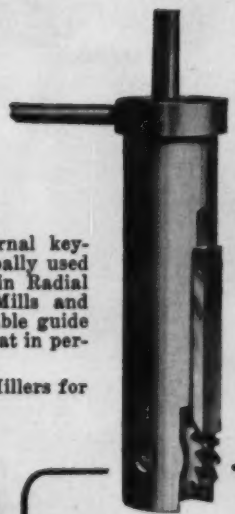
THE KEY TO BETTER KEYSEATS

NATIONAL
Keyseating Millers



NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

national
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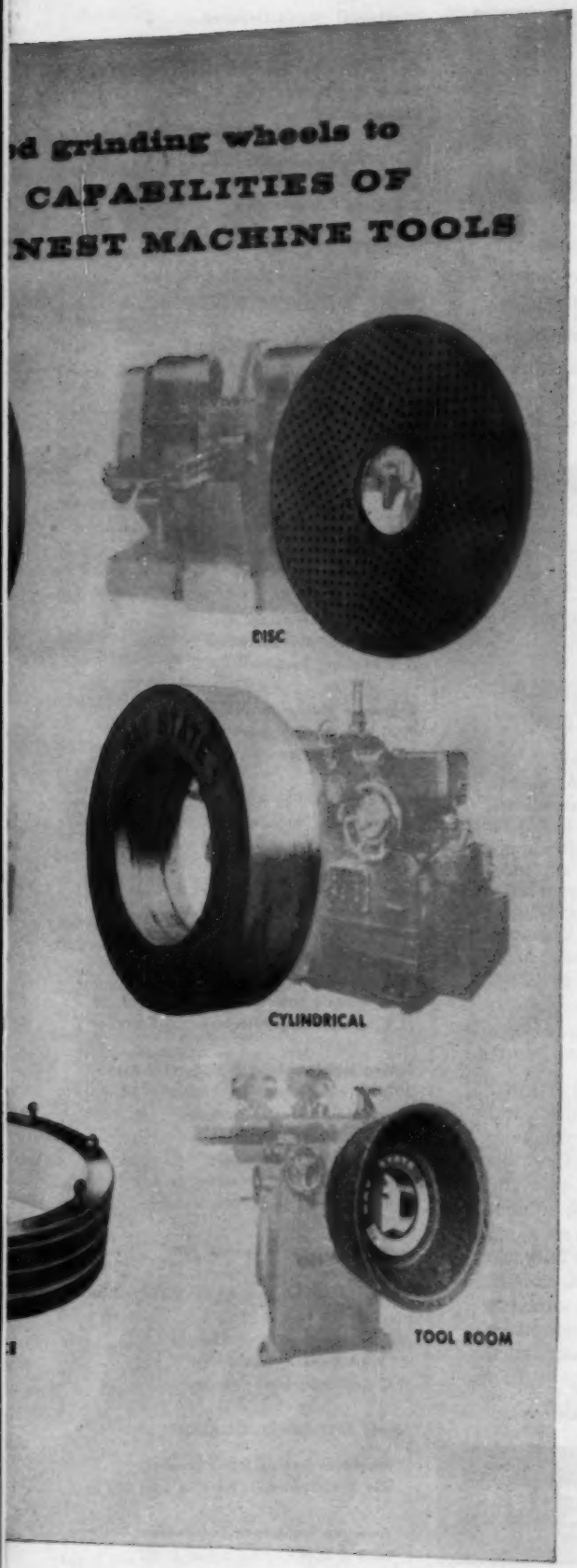
WRITE TODAY
for Catalog No. 17
complete, handy size

Precision-engine
MATCH T
THE WORLD'S



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WHEELS of PROGRESS

Bay State salutes the tremendous technological achievements of the Machine Tool Industry and joins with the industry in offering to users of machine tools the finest grinding equipment in the world. Working in close association with many of the foremost tool manufacturers Bay State, too, has built an outstanding reputation for technological advancement. Through vigorous and carefully planned programs of product development and research into entirely new materials and techniques, Bay State today is able to offer industry wheels for every known type of grinding operation... wheels that assure *"better grinding at lower cost."*

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WHY MICROHONING* of Accumulator Bores provides processing short cut

American Bosch Division of American Bosch Arma Corporation has recently added hydraulic cranking systems and a wide variety of hydraulic accumulators to their extensive line of precision equipment. Microhoning is specified as the only machining operation performed in the bores of the accumulator housings—here is why.

This horizontal Hydrohoner has a hydraulically reciprocated carriage, a ten-foot stroke and a four-speed transmission.

PROCESSING ECONOMY

The accumulator housings are made from mill stock tubing that is mostly either cold rolled welded or cold drawn seamless steel (some of the 4.750″ I.D. tubing is aluminum alloy). Economical processing of tube bores is realized through the inherent efficiency of Microhoning in generating geometry, size and surface finish. Microhoning is the only machining done on bores ranging in diameter from 3.000″ to 6.180″ and in lengths from 6.375″ to 123″.

RAPID STOCK REMOVAL

Accumulator bores are rough—and finished—Microhoned on the horizontal Hydrohoner shown. It is designed to provide rapid stock removal and generate accuracy in long bores. Rough-Microhoning of the mill stock tubing bores removes up to .040″ of stock at a rate of better than .001″ per minute. Finish-Microhoning removes .004″ of stock while generating final accuracies and specified surface finishes.

FUNCTIONAL BORES

In addition to consistent bores that are well within specified size and geometry tolerances, Microhoning provides controlled surface finishes of 7-8 microinches, rms. The Microhoned surfaces are so consistent that a check on a precision surface analyzer is made only two or three times per eight-hour shift. Microhoned bores assure smoother operation and longer life for piston seals in assembled accumulators.

**Registered U. S. Pat. Off.*

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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

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(continued on page 454)

"Thank you sir, for showing me how to lift."

HOW MICROHONING of Accumulator Bores provides processing short cut

Fast, economical generating of specified bore size, geometry and surface finish in accumulator housings is required by American Bosch Division of American Bosch Arma Corporation. Housings are made from mill stock tubing and Microhoning is specified as the most suitable process to consistently and quickly generate precision bores. Here is how a horizontal Hydrohoner provides a processing short cut.

The flange-type tool used to Microhone the 6.180" I.D. tubing has 8" long stones and four fibre guides. These stationary guides pilot the tool into the bore and prevent "collapsed" abrasives from marking precision bore surfaces when withdrawing the tool.

SIMPLIFIED PROCESSING

Because Microhoning characteristics include: rapid stock removal; consistent machining to specified size; correction of geometric irregularities; and generation of micro-inch finishes, there is no need for any other machining operation. Rough-Microhoning of the bores removes up to .040" stock at a rate better than .001" per minute. Then the finish-Microhoning operation quickly generates final size, geometry and surface finish. Thus, processing is simple, quick and economical.

AUTOMATIC GAGING

Gage Air Microsize is used to automatically terminate the Microhoning cycle as each bore reaches specified size. Microsize controls are interlocked with Hydrohoner controls, and the reciprocating gage spindle is synchronized with the tool spindle. Therefore, at each withdraw stroke of the tool, the gage spindle attempts to enter the bore. When it enters the bore, the air back-pressure is increased and at a predetermined back-pressure the Hydrohoner is automatically stopped.

HIGH EFFICIENCY

Another factor contributing to the high efficiency of this Microhoning set-up is the electric rotary feed tool. This design provides constant feed speed and maximum cutting action. Also, with rapid expansion and "collapse" of abrasives, it assures shorter cycle time than obtainable with conventional hydraulic feed mechanisms.

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PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

MICROMATIC HONE CORP.
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Basically mechanical . . . reduces complex electronics. Positive control by direct actuation (no feedback). All controls fully integrated with the machine. So practical it needs no provision for manual operation.

Barber-Colman's New Tape-Controlled Lathe

Tape-r

Understands two languages: . . . digital data and cost

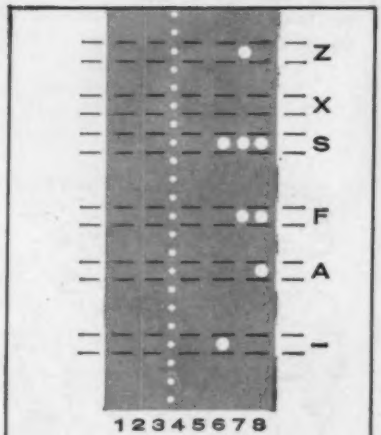
Now, you can gain all practical advantages of numerical control in a Barber-Colman precision lathe that greatly reduces complexity and equipment cost while retaining the ability to turn tapers and form simple radii.

Here is a fresh new approach to numerical control — one that removes any fear of systems incompatibility and leapfrogs into tomorrow's practicalities of low-cost operation and maintenance.

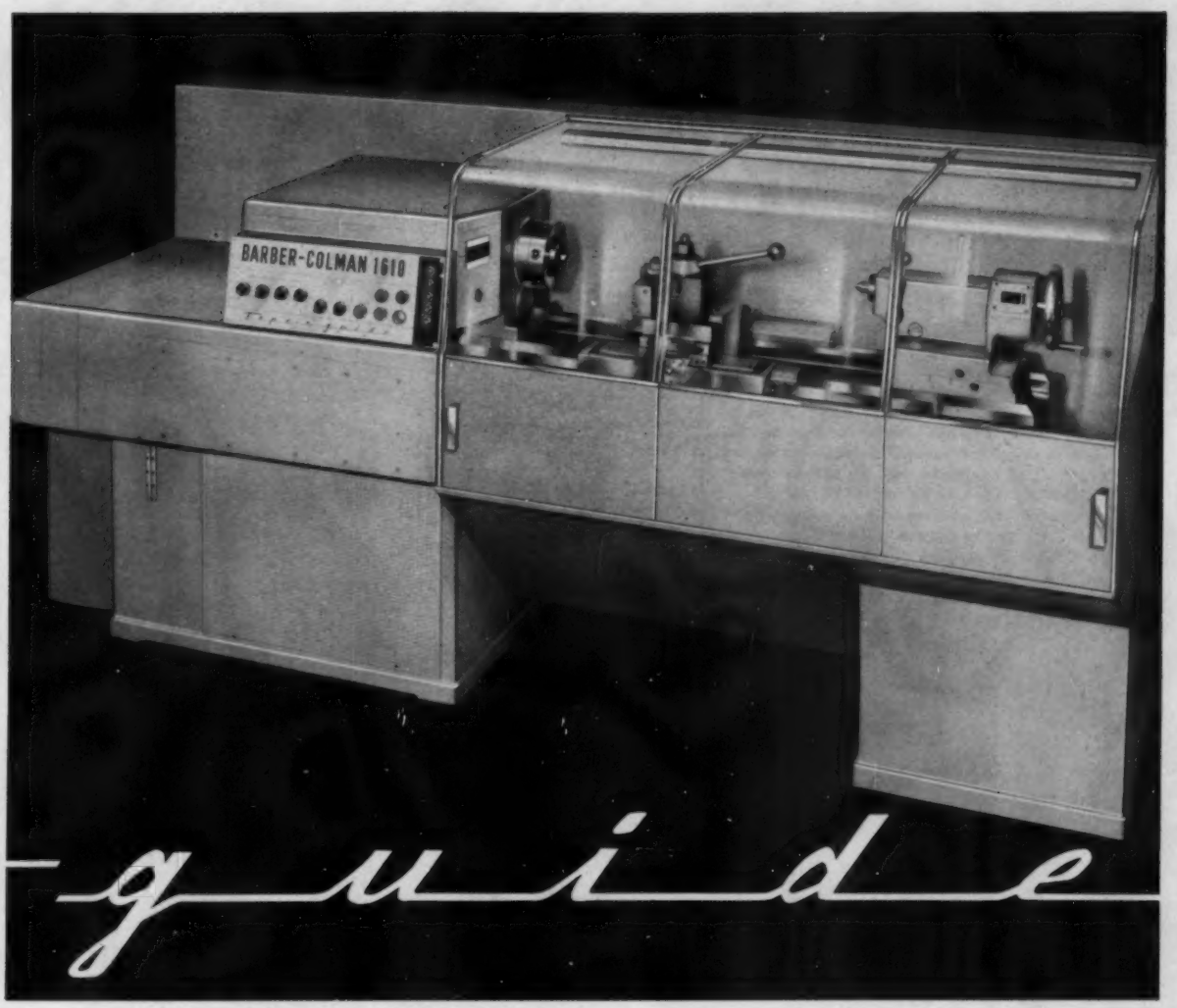
Now, you can sit in the driver's seat — relieve operating personnel of size control responsibility and set production rates on 90% of your routine jobs fitting a 16" swing lathe. The new Tape-r-guide handles all stop-start, positioning, speed adjustment, and feed change functions automatically from a simple 8-channel binary code tape. It will hold close tolerances on diameter and length, machine all practical tapers without "hunting," cut chamfers without special tools, cutoff and bore or machine at 90° to the work axis—all on a high-performance, precision lathe that has the simplified version of numerical control built-in.

The reader is part of the headstock. Controls are housed in the electrical panel on the back.

The big difference in Tape-r-guide is emphasis on simple and direct mechanical actuation. For example, compound differentials accurately control tapers. Relative speeds of the carriage and cross slide, controlled through mechanical clutches in gear trains, give you true angular tool



Simple coding . . . there are only six types of commands, and only one row is needed to give a complete "axis" command. The channels numbered one through five control rates, while the last three channels identify the command.



paths. There's no sensing and correcting of errors as with a servo drive — no complex electronics or data storage. An electrical signal from the tape reader initiates the mechanical cycle. Cycle then establishes feed rate, spindle speed, and direction . . . as well as any auxiliary functions.

The tape-coding system is simple. Only one row is needed on the tape for a complete axis command. Thus, only a few rows are required for each complete command sequence.

As an incremental system, coding is started from the first operation of the tool rather than from an absolute zero point. The over-all accuracy of the machine is limited only by the system resolution capability . . . plus or minus .001" on diameter and length. The lathe itself is the largest machine of its type on the market, produces super finishes and precision tolerances — fast. It has large swing capacities (16" and 20"), infinitely variable spindle speeds to 1200 rpm, rapid traverse of the cross slide and carriage, rugged frame castings made of dense Meehanite metal. All setup and operating controls are centralized on the headstock panel, adjacent to the tape reader.

Four dials for preselecting spindle speeds are actuated by tape commands at the proper time in the cycle. Another selector puts the machine into single-cycle operation for setup or fully automatic cycling.

Ask your Barber-Colman representative about the low cost of this basically mechanical, fully integrated, high-speed, numerically controlled lathe.

MODERN MACHINE TOOLS MMT=PE PRODUCTION EFFICIENCY

See the tape-controlled lathe turning tapers, too, in Booth 923 at the Exhibition. Qualified engineers will be on hand to answer questions.

Barber-Colman Company

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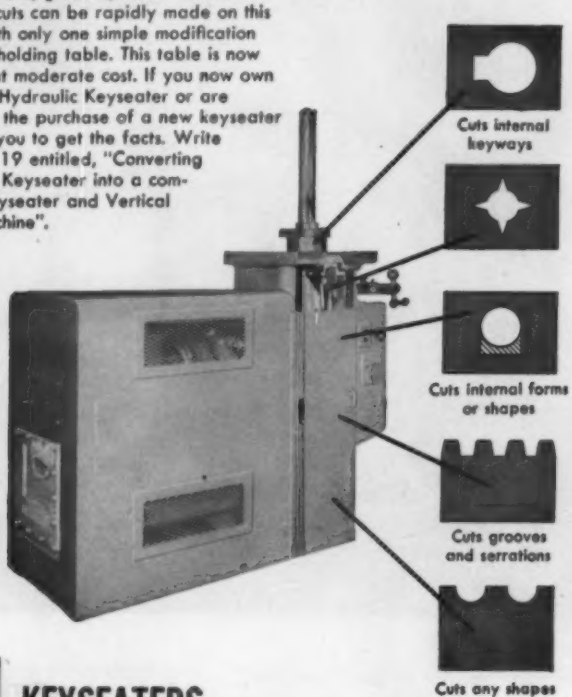
TRIPLE THE USEFULNESS OF YOUR M&M

KEYSEATER AND VERTICAL CUTTING MACHINE

Simple modification greatly increases productive capacity of this versatile machine.

An M & M Hydraulic Keyseater is not only a keyseater that cuts internal keyways up to 5" wide but a vertical cutting machine as well. Serrations, grooves, teeth—a wide variety of cuts can be rapidly made on this machine with only one simple modification — a work-holding table. This table is now available at moderate cost. If you now own an M & M Hydraulic Keyseater or are considering the purchase of a new keyseater it will pay you to get the facts. Write for Bulletin 19 entitled, "Converting the M & M Keyseater into a combination Keyseater and Vertical Cutting Machine".



M&M KEYSEATERS AND VERTICAL CUTTING MACHINES

98

MITTS & MERRILL • 104 Holden Street • SAGINAW, MICHIGAN

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WHEN YOU GET TO CHICAGO . . .

. . . don't fail to visit the AM/MM booths

American Machinist/Metalworking Manufacturing will have two exhibit booths at the 1960 Chicago Exposition: Booth 1534 at the Amphitheater and Booth 131 at the Navy Pier. We hope you'll stop by and meet our staff members in attendance.

American Machinist/Metalworking Manufacturing . . . at the 1960 Chicago Exposition

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(continued on page 458)

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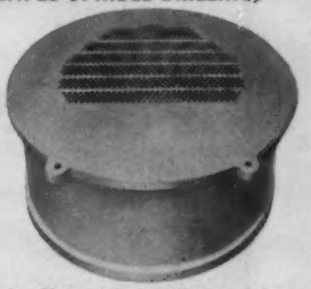
MULTI-NUMETRIC Numerical Control

(AS APPLIED TO MULTIPLE SPINDLE DRILLING)

Expertly Designed MOLINE "HOLE HOG"

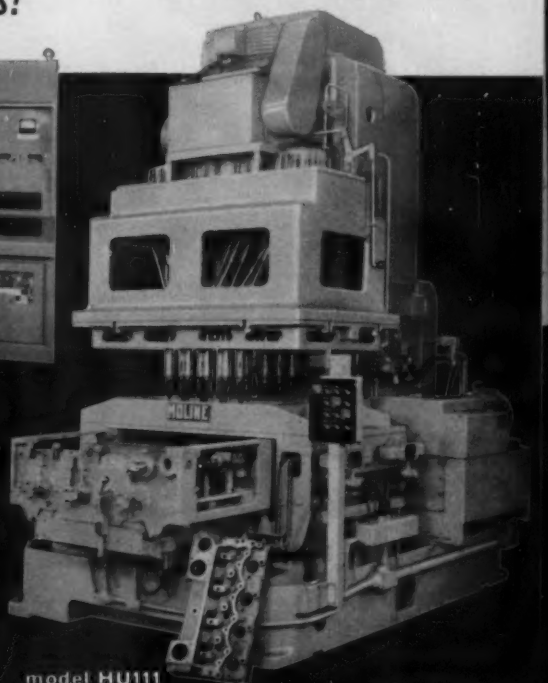
Machine Tools for—

- *Greater Production*
- *Efficiency*
- *Savings!*



Tube Sheet drilled and reamed by Model HD68 Multiple Spindle Machine. The drilled steel plate is approximately 48" diameter and 1½" thick.

model **HD68** Tube Sheet Drilling Machine with Multi-Numetric Numerical Control for positioning of machine table in two directions and for selection of spindles. Information on punched tape permits automatic drilling of a complete hole pattern in a tube sheet without interruption.

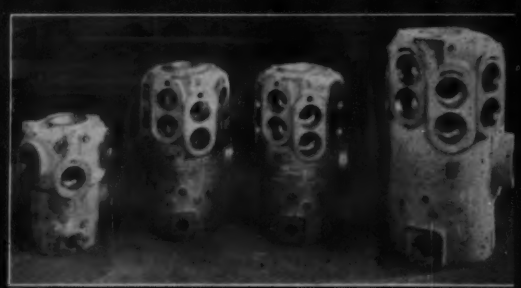


model **HU111** Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 50" drilling area and with forty-two 1½" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.

60 years of Machine Tool Engineering experience is at your service for

- **Multi-Spingle Boring**
- **Straight Line Multi-Drilling**
- **Single and Multi-Spindle Honing**
- **Adjustable Spindle Drilling**
- **Special Multiple Operation Machine Tools**

model **MR149** Single Spindle, Horizontal, Hydraulic Feed, Automatic Boring Machine for rough and finish boring two different styles of 3, 4, 5, 6 and 8 cylinder compressor housings to receive wet-type cylinder sleeves.



Examples of compressor housings bored by MR149 machine. Automatic indexing fixture on machine turns the housing radially and shifts it longitudinally to bring each hole to correct location for boring and facing.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY

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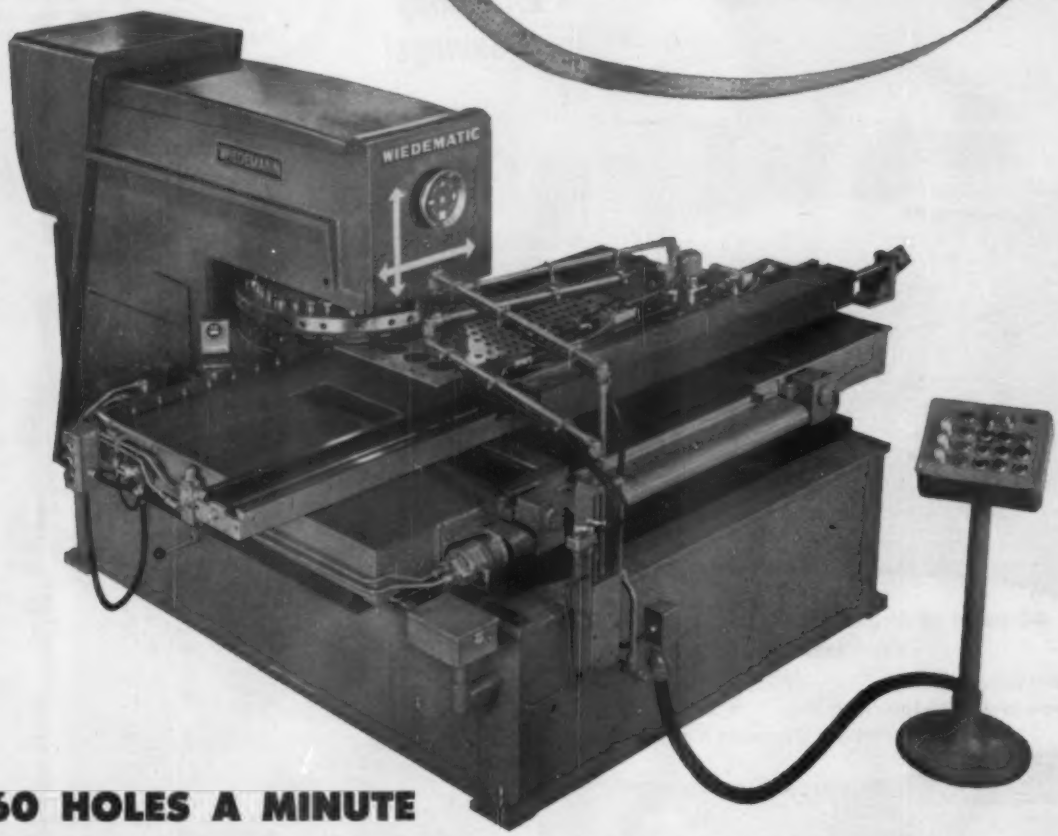
SEE THE BIG ADVANCES

WIEDEMATIC
TURRET PUNCH PRESS
with Numerical Positioning Control



60 HOLES A MINUTE
with Automatic Work Positioning and Tool Selection

SEE the Wiedematic position and punch holes of many sizes and shapes automatically in actual production runs of sheet metal and plate parts.

SEE how all press operations are controlled with amazing speed and accuracy by an easily prepared punched tape.

SEE how the Wiedematic Method reduces production costs 60% to 90% and provides the key to major savings in every other phase of your operations from design to final assembly.

Be sure to see the Wiedematic in operation — Booth 1249 at the Machine Tool Exposition,

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WIEDEMANN MACHINE COMPANY
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IN FLEXIBLE FABRICATION

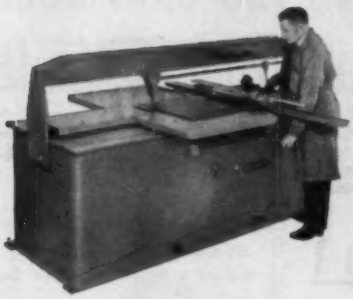
WIEDEMANN TEMPLAMATION

Making Full Use of Low Cost Templates For Fast, Accurate Piercing

SEE how Wiedemann Templamation employs templates to ensure accuracy and reduce piercing costs.

SEE how high accuracy templates are made rapidly on the COORDINATOR . . . inspected without guesswork on the direct reading INSPECTOR . . . then used for positive work positioning on a WIEDEMANN Turret Punch Press equipped with a high speed follower gauge.

SEE how Wiedemann Templamation gives you many of the advantages of automation with manually operated machines.



1. TEMPLATE IS MADE ON THE WIEDEMANN COORDINATOR

2. TEMPLATE IS INSPECTED ON THE WIEDEMANN INSPECTOR

3. TEMPLATE IS USED FOR HIGH SPEED HOLE POSITIONING ON THE WIEDEMANN RA-41P TURRET PUNCH PRESS

Other Wiedemann Turret Punch Presses will also be in operation.

THEN HEAD FOR THE FAR CORNER—BOOTH 1249

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SANDVIK Coromant

Truck differential shaft being machined with Coromant Tool in New Britain + GF + Lathe located in the plant of a leading manufacturer of automotive axles.

Outproduces Competitive Carbides 2 to 1

On New Britain +GF+ Lathe Operation

Coromant S2 Rhomboids Turn 80 Parts Per Edge—More Than Double The Record of 3 Competitive Brands Under Identical Conditions At A Leading Automotive Axle Manufacturer.

PRODUCTION AVERAGES	
GRADE	AVERAGE PIECES PER CUTTING EDGE
Sandvik CORAMANT S2	80
COMPETITIVE PREMIUM GRADES	
Brand 1	35
Brand 2	30 to 40
Brand 3	Under 30

PART —Truck Differential Piniens and Shafts —(Steel Forgings) 200-210 Brinell Hardness
RPM —701 FEED—.022 SURFACE SPEED (SFPM)—400
DEPTH OF CUT —Varies from 1/4" to 9/16"
CHIP BREAKER —.125" wide x 9° positive rake with hand honing
HOLDER —COROMANT—GF—170-5058
INSERT —COROMANT—RF-203 GRADE-S2

This cost-saving success resulted from the combination of Coromant Carbide quality and Coromant's field service engineering. Contact your nearest Coromant office or send for complete catalog.

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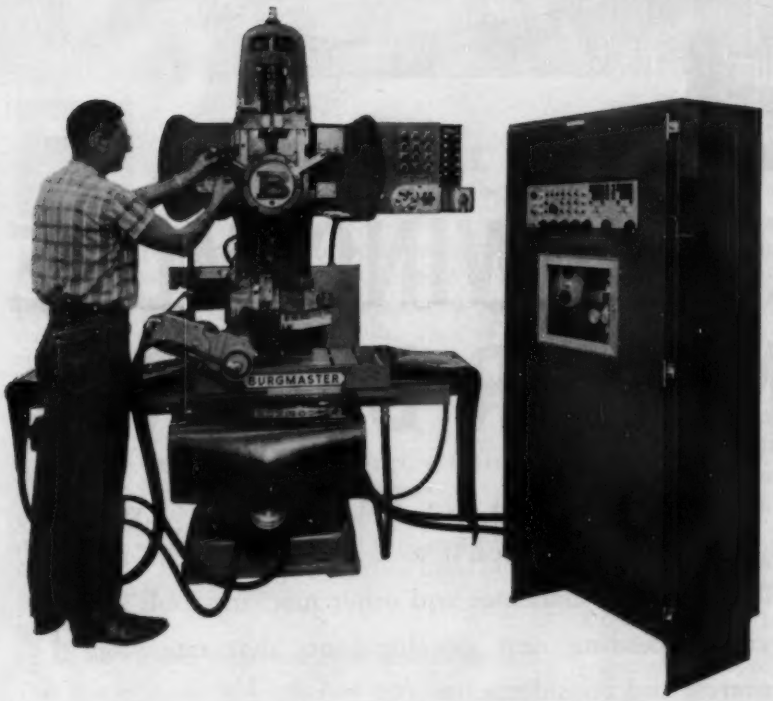
Oscar M Diezel, Secretary

"All of it is being withheld and you owe us an additional seven dollars and thirty-two cents."

lead time cut over 50%— $3,000 saved on tooling with Hughes Tape Controlled Burgmaster



PROBLEM: To drill, countersink and tap 69 holes, including radial locations, to close tolerance in 50 missile bulkheads.

SOLUTION: Hughes All-Electronic Numerical Controls, a precision Rotary Table, the Burgmaster Turret Drill with two-axis positioning table, and existing simple fixtures and clamps. The need for complex multi-base drill jigs and other expensive tooling was eliminated.

RESULT: Hughes Tape Controlled Burgmaster saved over $3,000.00 in tool design and manufacturing time. Lead time was reduced by five weeks.

Hughes All-Electronic Numerical Controls are completely transistorized—and are immediately available for use on new machines or for retrofit of older units. These controls are now offered as standard equipment with Burgmaster Turret Drilling Machines.

For more information on how you can increase your profits with a Hughes Tape Controlled Burgmaster, contact your local Burgmaster Representative. Or, write:

HUGHES Industrial Systems Division, P.O. Box 90904, International Airport Station, Los Angeles 45, California.

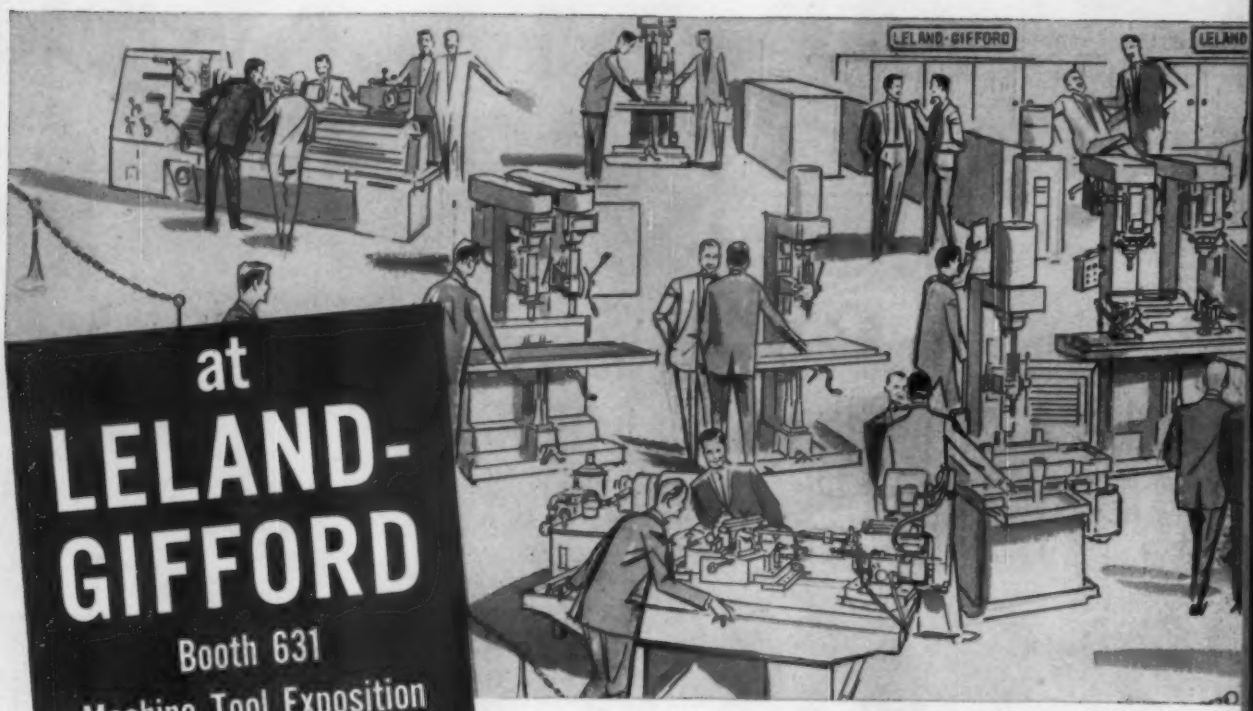
For export information, write: HUGHES International, Culver City, California.

Creating a new world with ELECTRONICS

HUGHES

INDUSTRIAL SYSTEMS DIVISION
HUGHES AIRCRAFT COMPANY

See the new Hughes
3 axis (x, y, and depth axes) Numerical Control
in operation at Burg Tool Company Exhibit
Booth No. 834—Machine Tool Exposition.



at
LELAND-
GIFFORD
Booth 631
Machine Tool Exposition
International Amphitheatre

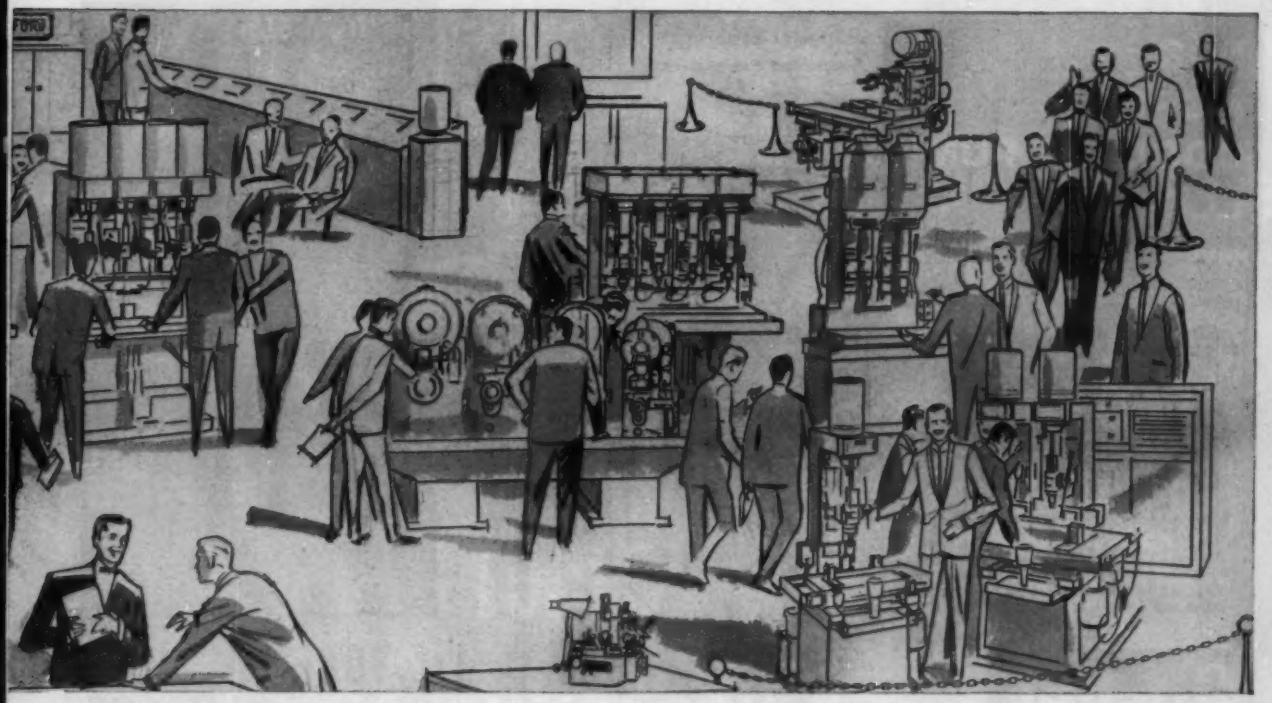
WE'RE SHOWING MORE THAN EVER BEFORE

Put Leland-Gifford Booth No. 631 at the top of your Machine Tool "must" list. You'll see a major display of up-to-the-minute drilling machines and other machine tools . . . plus seven outstanding new developments that rate your highest interest and consideration.

Every machine will be set up and operating and the booth will be fully staffed with engineers who know the machines and how to apply them to your production problems.

THE MACHINE TOOL EXPOSITION —1960
MMT-PE
Sept. 6-16, CHICAGO, ILL.

✱ *If you can't make the show, we'll be glad to send complete information on these important new developments.*



7 MAJOR NEW DEVELOPMENTS

NEW TAPE CONTROLLED "HOLE LOCATOR" FOR PRINTED CIRCUIT BOARDS

Designed especially to speed and improve production of electronic circuit boards. This two-spindle HOLE LOCATOR with punched tape control and self-contained automatic feed drilling units will position and drill up to 100 holes per minute.

NEW GENERAL PURPOSE TAPE CONTROLLED PRECISION "HOLE LOCATOR"

Adds punched tape automatic table positioning to the proven ability of the Leland-Gifford HOLE LOCATOR to locate and drill precision holes in a wide variety of production work.

NEW EIGHT INCH HORIZONTAL GUN DRILL

This new 8" stroke hydraulic feed horizontal gun drill is column mounted to facilitate work positioning and to simplify fixturing when used for producing multiple holes in a single part.

NEW TWENTY-FOUR INCH GUN DRILL

Features lead screw feed synchronized to and governed by spindle speed. Speeds are readily changed by a quick sheave change and feeds by pick-off gears.

NEW NO. 1MVB MULTIPLE SPINDLE DRILLING MACHINE

Provides almost unlimited speed range and extreme sensitivity at comparatively low cost. V-belt driven from standard NEMA motors and capable of speeds up to 10,000 rpm.

NEW NO. 2LVS MEDIUM DUTY DRILLING MACHINE

Offering continuous speed range from 100 to 3,000 rpm through variable speed drive and back gears.

NEW "DRILL POINT MASTER" DRILL SHARPENER

A completely new concept in a precision twist drill grinder that will produce or reproduce a drill point of any specified geometry on drills from #80 to .250" diameter. Precise adjustments control locating, indexing, point angle, relief angle and point thinning. Built-in microscopic viewers assist in setting and inspection.

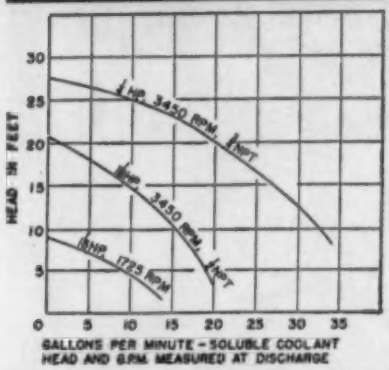
PLUS A COMPREHENSIVE DISPLAY OF THE COMPLETE LELAND-GIFFORD LINE

. . . including multiple spindle drilling machines, self-contained drilling units, standard "Hole Locators", lathe tracer attachments and drill jig bushings.

LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS

FOR MORE COOLANT PUMP ECONOMY*



*Performance Chart

Gusher
Sealess-Type

Gusher flange mounted coolant pumps feature a simple design with no seals, no packing or priming necessary. They are designed to mount on the side of the reservoirs with either external or internal discharge. Immersed type also available.

Model 5-P

See our booth #376 Chicago Production Engineering Show.

RUMACO
Seal Type

Rumaco pumps are seal type, centrifugal pumps that can be mounted in any convenient place. Precision built, Rumaco pumps give efficient, trouble-free operation. Seals are the best obtainable.

Model 5-S

WRITE FOR FURTHER INFORMATION TODAY

THE Ruthman MACHINERY CO.

1819 Reading Road, Cincinnati 2, Ohio

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

Special Reports . . .

(continued from page 399)

1955

392 Tailor-Made Instruments for the Greatest Machine Ever—May 9 '55, 20p (30¢)
393 How Allison Inspects Vendor Parts—May 23 '55, 16p
394 What Europe Knows About Iron-Powder Metallurgy—May 23, '55, 12p
395 How GE Makes Gas Turbines—June 6 '55, 16p
396 How to Set Up a Plug and Ring Gage Policy—June 20 '55, 8p
397 Doorway to a Better Tomorrow—Jul 4 '55, 8p
398 Tooling and Training Tell the Tale—Jul 18 '55, 16p
399 Gears Untouched by Human Hands—Aug 1 '55, 12p
400 Plymouth Builds High-Production Engine Line—Aug 15 '55, 16p
401 How to Work Titanium and its Alloys—Aug 15 '55, 16p
402 1574 Companies Report '56 Plans—Aug 29 '55, 16p
403 How Copying Lathes Cut Costs—Sept 12, '55, 16p
404 When You Redesign . . . Retool—Sept 26, '55, 16p
405 The Chicago Show Report—Sept 26 '55, 19p
406 The World's Biggest Job Shop—Oct 10 '55, 24p (35¢)
407 How to Work Superalloys—Oct 24 '55, 8p
408 How to Finish Stainless—Nov 7 '55, 16p
409 How to Work Non-Ferrous Metals—Mid-Nov '55, 112p ($1)
410 How to Tool with Plastics—Nov 21 '55, 14p
411 Greist's Money-Making Formula—Dec 5 '55, 16p
412 Surface Metallography Solves Production Problems—Dec 19 '55, 12p

1956

413 Ultrasonics—Jan 2 '56, 8p
414 Small-Shop Tooling Makes Hollow-Blade Jet Stators—Jan 30 '56, 8p
415 Brains for Planes—Feb 13 '56, 16p
416 Disaster Control—Feb 27 '56, 32p (50¢)
417 Tomorrow's Cutting Tools—Mar 12 '56, 22p
418 How Machining Influences Life of Cast-Iron Ways Mar 26 '56, 8p
419 Tooling Behind the Telephone—Apr 9 '56, 24p
420 Silver Brazing Techniques—Apr 23 '56, 8p
421 Advanced Tool Design for Plastic Injection Molds—May 7 '56, 16p
422 The World's Most Accurate Gears—May 21 '56 8p
423 Compression and Transfer Molds—June 5 '56, 16p
424 These Assembly Ideas Save You Money—Jun 18 '56, 8p
425 Models Are Tools, Not Toys—Jul 2 '56, 16p
426 Titanium Today—July 16 '56, 16p
427 How to Make Machine Capability Studies—Jul 30 '56, 8p
428 How to Cut Off Metals—Aug 13 '56, 16p
429 New Tooling and Techniques Work Wire—Aug 27 '56, 8p
430 Automatic Assembly—Sept 10 '56, 16p
431 Making Molybdenum Work—Sept 24 '56, 12p
432 Cold Hubbing—Oct 8 '56, 12p
433 Checklist for Press-Tool Design—Nov 5 '56, 12p
434 How to Find Money for your Business—Nov 19 '56, 16p
435 How Good are Ceramic Tools?—Dec 3 '56, 24p
436 Logic Functions—Dec 17 '56, 8p

(continued on page 467)

"Going home early today, boss?"

YODER ROTARY SLITTERS

If your slitting requirements call for coil widths from 12" to 60", in gauges from .015" to .250", the economy of purchasing Yoder Slitting Machinery can be yours. Operating a Yoder Slitting Line only one eight-hour shift per week, for example, could easily produce 35 tons of slit strands per week . . . or 1,820 tons every 52 weeks. At a slitting cost saving of only ½¢ per pound, the annual savings would amount to $18,200.

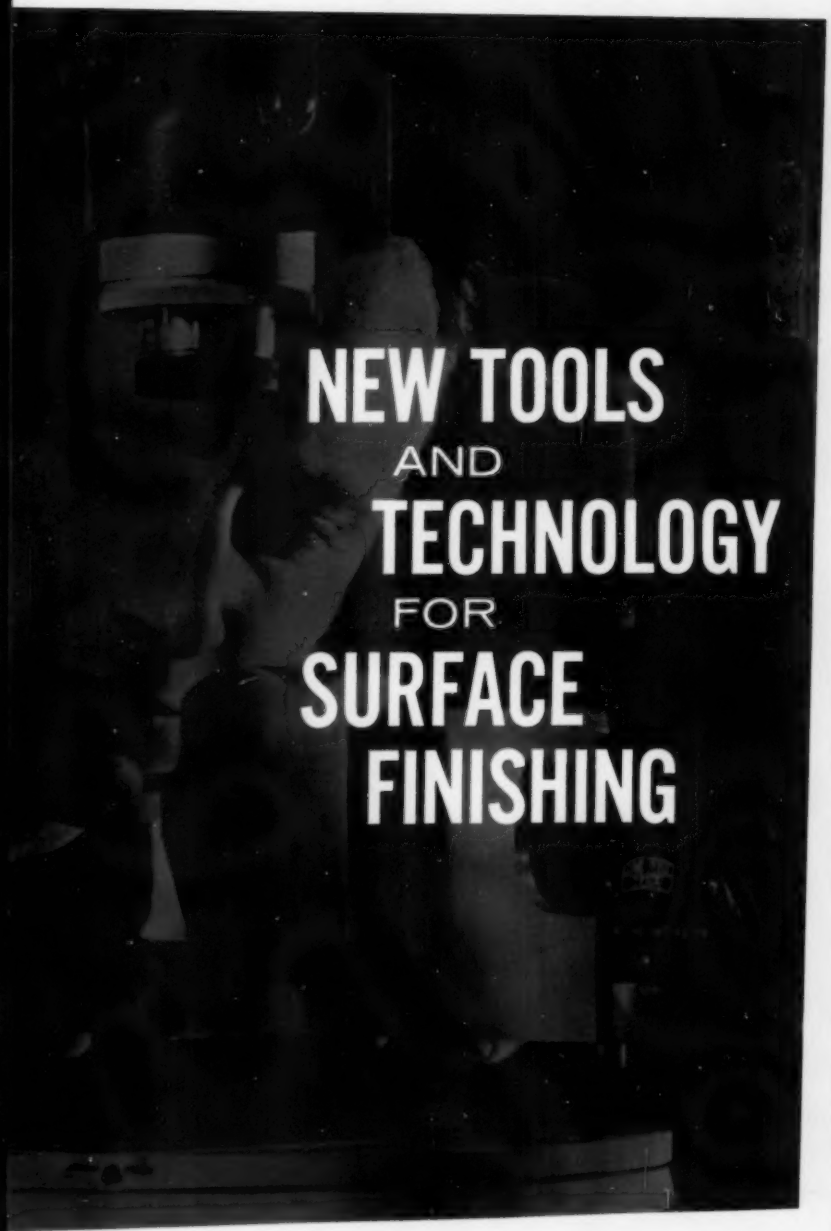
Additional savings can be realized through lowered inventory of mill-width coils — less waiting for delivery of special slit widths. Also, customer satisfaction will increase as you achieve faster completion and delivery of finished products.

At your request a Yoder sales engineer will study your plant operation to determine what equipment would most economically . . . and profitably . . . serve you, whether it be standard components or a completely specialized and engineered line.

Send for Yoder's illustrated text on slitting operations and equipment. It describes methods, time studies, operating cycles, material handling, and gives full specifications.

THE YODER COMPANY
5519 Walworth Avenue • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING
ROTARY SLITTING LINES



NEW TOOLS AND TECHNOLOGY FOR SURFACE FINISHING

MICROSTONING is the new word in metal working — the exclusive process that produces controlled microinch surface finish AND corrects geometric errors.

Taft-Peirce is building these revolutionary Supfina Microstoning tools to give **better results** in **less time** on critical finishing jobs:

Supfina Taft-Peirce/Microstoning Attachments . . . for mounting on existing machine tools for Microstoning virtually any material.

Taft-Peirce/Supfina Microstoning Plunge Cut Machines . . . for finest finish and improved roundness of small cylinders — fast and easy.

Taft-Peirce/Supfina Microstoning Through-Feed Machines . . . Five steps — five stones — from roughness to precision, and completely automatic.

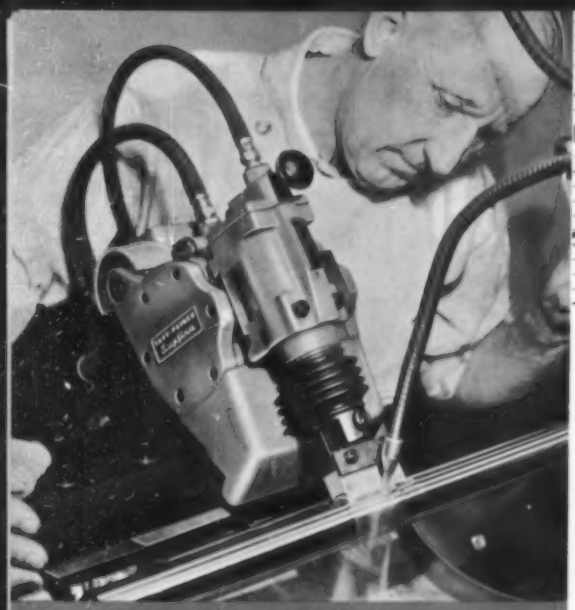
No. 1 Precision Surface Grinders . . . the gagemaker's grinder that splits hairs, time after time after time.

24" Semi-Automatic Lapping Machines . . . for light-band accuracy on production runs.

TAKE IT TO TAFT-PEIRCE

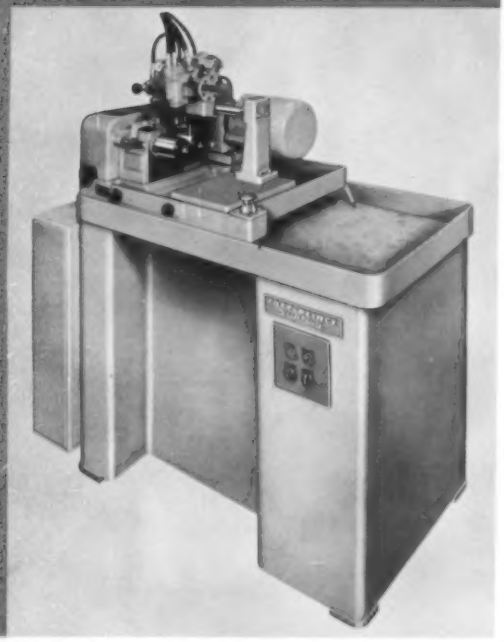
TAFT-PEIRCE MANUFACTURING COMPANY
13 MECHANIC AVE., WOONSOCKET, RHODE ISLAND

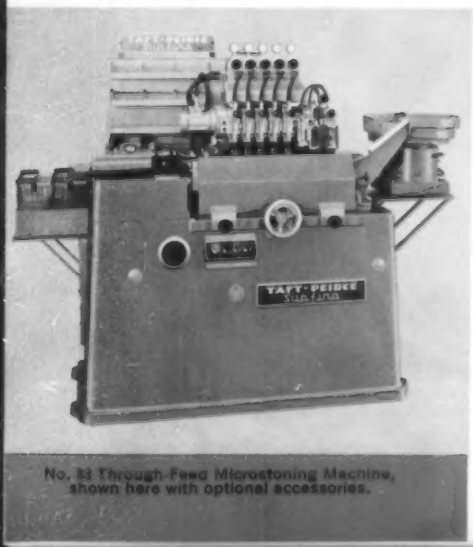
Gagemaker Accuracy



Above, Microstoning a Shaft with Supfina Attachment.

Below, No. 86 Centerless Plunge-Cut Microstoning Machine.





No. 88 Through-Feed Microstoning Machine, shown here with optional accessories.

Taft-Peirce/Supfina Microstoning Attachments Give Controlled Microinch Finish Plus Geometric Correction

Models 9680 & 9681 When specifications call not for just the "best finish," but for a finish controlled to a precise microinch reading, and when near-perfect roundness is a must — Taft-Peirce/Supfina Microstoning Attachments are the answer. These pneumatic marvels are easily attached to any machine tool that will move the work beneath the stones. They remove the amorphous skin left by previous operations; level the hills and valleys; eliminate chatter, feed spiral marks, and other surface imperfections induced during machining. Any metal, of any degree of hardness, and glass, plastics, and similar materials, can be Microstoned, and the Attachments are adaptable to flat, external cylindrical, or tapered surfaces. Saving steps and time over any other method, they also give vastly better results. They work fast and economically too.

Microstones, in a wide variety of shapes, grit sizes and bond hardness, are oscillated by Supfina Attachments against the moving work, generating a perfect surface without appreciable reduction in size of the work piece.

There's a place for Supfina in every shop that ever has small-lot or unusual jobs that require the ultimate in microinch finishing.

Centerless Plunge-Cut Microstoning Machine Produces Quality in Volume

Model 86 For fine finishing of small cylindrical pieces, where volume of production and superior quality are both factors, the Taft-Peirce/Supfina Plunge-Cut Microstoning Machine offers the manufacturer a shortcut to superior results.

It's fast. With its cycling action infinitely variable, it spins the work beneath the Microstones. It starts slowly for maximum material removal, speeds up for final finishing, then stops, ready for the next piece — and all in seconds!

It's simple to use. A semi-skilled operator can turn out precision pieces with ease.

It's Adaptable. Custom-made Taft-Peirce rolls for the work staging system will accommodate small cylinders of almost any shape. It's a piece of equipment that will prove profitable anywhere cylindrical surfaces up to 2" in length and from $\frac{1}{8}$" to $1\frac{1}{8}$" in diameter are produced in medium or large lots.

Automated Production Microstoning

Model 88 For completely automated production of superbly finished cylinders, Taft-Peirce offers the Supfina Through-Feed Microstoning Machine. Once set up, this machine will run for hours virtually untended, turning out work pieces rapidly with finish otherwise attainable only by long, tedious and highly-skilled handwork. Pieces that go through the Model 88 Microstoning Machine can be worked on by as many as five Microstones — from coarse for maximum material removal to very fine for high polish — using infinitely adjustable time cycles. Adjustable work rolls make it adaptable to any cylinder from $\frac{3}{16}$" to $2\frac{3}{8}$" diameter.

Auxiliary tooling for gaging and material transfer can be designed and built to meet the needs of special jobs.

on a Production Basis

Surface Grinding with Superior Accuracy

The Taft-Peirce No. 1 Precision Surface Grinder, original item in the growing line of Taft-Peirce Machine Tools, was developed to meet the requirements of the company's gagemakers. It has many features that make it outstanding among grinders. Crossfeed accuracy to .00005″ and downfeed accuracy to .000012″ are built in to these machine tools. The special anti-backlash crossfeed mechanism guarantees repeatability to hair-splitting tolerances every time.

Exclusive ball or roller ways for table, saddle, and column not only make parts move almost effortlessly, but also are completely replaceable, making the No. 1 Surface Grinder truly the "machine that lasts forever." Another exclusive feature is the adjustability of the table ways. With other grinders, if the table is thrown out of line rescraping or shimming is necessary. With the Taft-Peirce No. 1, simple adjustments can quickly restore perfect alignment.

Simple controls, conveniently placed, make the No. 1 a pleasure to operate — a machine on which the operator can turn out his best work for long periods without fatigue. Many attachments and accessories are readily available — such as high-speed attachments, wet grinding attachments, and more — to make this an extremely versatile machine, capable of doing almost any surface grinding job, and doing it to gagemakers' standards.

Left,
The Taft-Peirce No. 1 Precision Surface Grinder.

Below,
Taft-Peirce 24″ Semi-Automatic Lapping Machine.

Production Lapping to Light-Band Accuracy

Flatness to one light-band (.000011″) and surface finish to one R.M.S., can be achieved easily on the Taft-Peirce 24″ Semi-Automatic Lapping Machine. Exclusive plate mounting methods allow use of reversible plates for longer wear and for quick conversion to either plain or serrated surfaces. Concavity is adjustable to compensate for normal wear or to step up efficiency on certain lapping jobs. Compound dispensing is completely automatic, and tanks with built-in agitators are readily interchangeable. A Taft-Peirce engineer can show you how you can get better results on your own individual jobs by using the Semi-Automatic Lapping Machine.

MAIL COUPON TO

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

Send more information on Taft-Peirce

- ☐ Contract Manufacturing
- ☐ Supfina Microstoning
- ☐ Grinding & Lapping Machines
- ☐ Production & Inspection Equipment
- ☐ Instrument Gaging
- ☐ Magnetic Chucks

Name..... Title.....

Company.....

Street.....

City & State.....

☐ Please Have Salesman Call as Soon as Possible

Special Tools do Special Jobs

BETTER, FASTER, AND MORE PROFITABLY

Taft-Peirce Can Design and Build Custom Equipment to Streamline Almost Every Production Job

Nothing does a job as well — and as profitably — as equipment designed for a specific production need. Taft-Peirce can supply that kind of equipment, just for you.

Under one roof, Taft-Peirce has assembled a team of design engineers and production experts, and equipped them with the best facilities. They are prepared to develop, from concept to any point up to and including installation, special machine tools that will convert problems into production.

Because of long experience in the gaging and machine control fields, Taft-Peirce is particularly well qualified to design and produce automated devices for precision manufacture.

Many manufacturers have turned to Taft-Peirce for custom machinery. Most of these jobs cannot be discussed because the projects were handled in strict confidence, and they're still giving their owners an edge on competition by producing with utmost efficiency. With others, there's no secret, and there are enough of these to demonstrate how Taft-Peirce can help you.

Taft-Peirce people will gladly advise on any machine production problem, and recommend the most practical solution. You're sure of satisfaction when you *Take It To Taft-Peirce.*

STANDARD TAFT-PEIRCE PRODUCTS

- Instrument Gages
- Production and Inspection Tools
- Magnetic Chucks
- Grinding Machines
- Lapping Machines
- Supfina Microstoning Machines

TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
13 MECHANIC AVE., WOONSOCKET, RHODE ISLAND

Special Reports . . .

1957

437 Small-Lot Production on High-Production Machines—Jan 14 '57, 10p
438 Ultrasonic Deburring—Feb 11 '57, 8p
439 Modern Management for the Small Shop—Feb 25, '57, 8p
440 Advanced Tooling Speeds Tiger Production—Mar 11 '57, 16p
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443 Automatic Assembly—May 6 '57, 12p
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446 Production Man's Guide to Numerical Control—July 15 '57, 24p (50¢)
447 How to Thermoform Plastic Sheet—Jul 29 '57, 16p
448 How to Apply Hardness Testing in the Shop—Aug 12 '57, 8p
449 Welded Steel Tubing—Sept 9 '57, 16p
450 How to Design Practical Tooling for Cold Extrusion—Oct 7 '57, 16p
451 Impact of Automation—Oct 21 '57, 16p
452 Production Proved Numerical Control—Nov 4 '57, 12p
453 Metalworking—1962—Nov 18 '57, 32p (50¢)
454 Planned Facilities with Built-in Profits—Dec 16 '57, 8p

1958

455 How Link-Belt Got a New Plant . . . without building one—Jan 13 '58, 8p
456 Cost Reduction Program—Feb 24 '58, 10p (30¢)
457 Where Metalworking is Heading—Mar 10 '58, 12p
458 How to Automate Production Equipment—April 21 '58, 16p
459 The ABC's of Machine-Hour Rates—May 5 '58, 16p
460 Multiple Spindles Cut Holes, Faster, Cheaper, Better—May 19 '58, 16p
461 Production Engineer's Guide to Adhesive Bonding—June 30 '58, 8p
462 How to Choose and Use Electrical Adjustable-Speed Drives—July 14 '58, 8p
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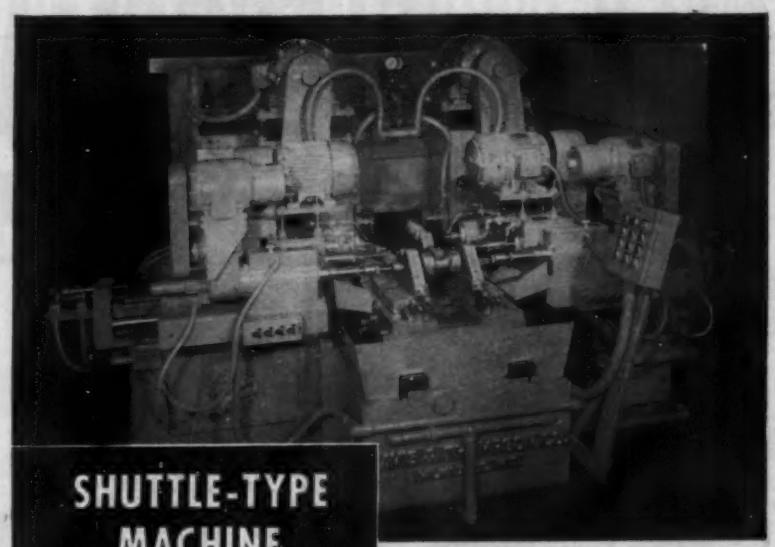
464 Production Man's Guide to Fastening Devices—Sept 8 '58, 16p
465 GE Reveals How it Makes Large Gears—Sept 22, 58, 8p
466 Modernize Now for Growth and Profits—Oct 20 '58, 32p (50¢)
467 And Must be Round Within—Dec 1 '58, 12p
468 How Air-Control Devices Aid Production—Dec 15 '58, 8p

1959

469 How to Plan Safer Setups for your Press Department—Feb 9 '59, 8p
470 Progress Report on Man-Made Diamonds—Mar 23 '59, 8p
471 Foreign Machine Tools in US Metalworking—Apr 20 '59, 8p

(continued on page 470)

"I was gone two weeks, Buxton. That was your vacation."



SHUTTLE-TYPE MACHINE HANDLES OVER 40 DIFFERENT VALVE PARTS

. . . Mills, Centers, Tap Drills and Taps in #316 Stainless

Here's a good example of engineering a semi-standard machine to handle a lot of parts. Although this machine has been adapted to milling, centering, drilling and tapping of valve parts, its basic design lends itself to other operations through the addition of various types of heads as well as multiple spindle drill heads. Machine incorporates hydraulic controls for table feed and index, two milling heads, two hydraulic power heads, each with center drill and tap drill spindle, and two mechanical screw feed tapping heads to accommodate 16, 20 and 24 pitch threads. Capacities range from ⅜" to 4½" diameter, 5" to 23" long. Parts are inner valves for liquid level controls of tough #316 stainless steel.

If you need high production of one part or moderate production of many parts *with a minimum capital outlay,* it will pay you to call in a D & T production engineer. There is no obligation for this service.

FREE DATA
Write for Bulletin 1002.

Roto-Matic
Davis and Thompson Co.
4460 N. 124th ST. MILWAUKEE 18, WISCONSIN

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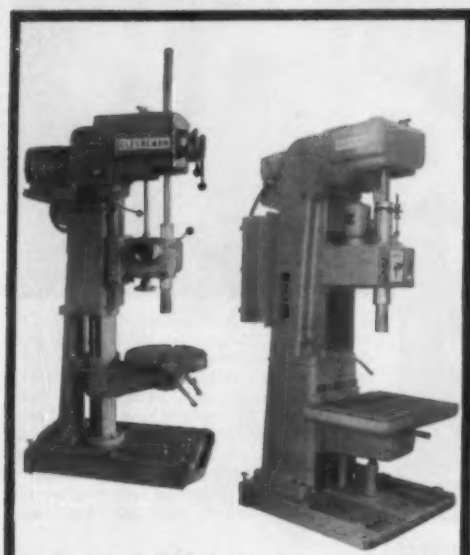
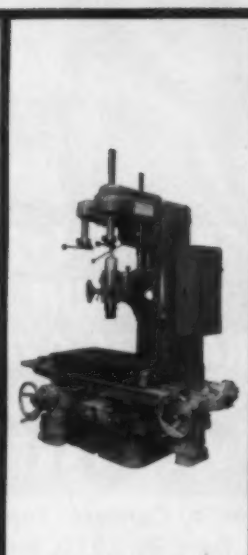
American Machinist / Metalworking Manufacturing Special Reports to the Metalworking Industries are currently available in reprint form. They cover as many subjects of vital interest to you. For complete list of titles, write Reader Service Department, American Machinist/ Metalworking Manufacturing, New York 36.

CLEEREMAN

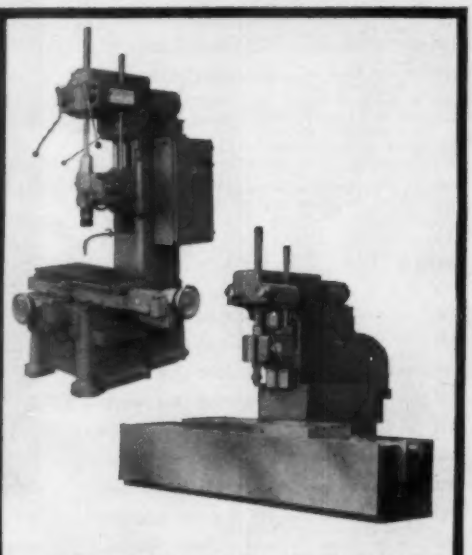
BUILDS ALL THREE!



Sliding Head and Automatic Cycle Drilling Machines



Precision Jig Borers



Automatic Positioning, Numerically Controlled and Standard Layout Drilling Machines

VISIT BOOTH 632

NATIONAL MACHINE TOOL EXPOSITION
INTERNATIONAL AMPHITHEATRE

ROUND COLUMN AND BOX COLUMN SLIDING HEAD DRILLING MACHINES produce accurate holes economically at high speed, and are general purpose machines which stand up under extreme production schedules. Box Column Machines have exceptionally rigid construction for accuracy and speed on continuous heavy duty work. The Series A or Automatic Cycle Drilling Machine is capable of producing small or large production lots at a minimum cost. All Drilling Machines are furnished as single spindle, multiple spindle or gang drills.

STANDARD AND NUMERICALLY CONTROLLED LAYOUT DRILLING MACHINES handle work with tolerances ±.001″ per foot or broader, with extreme convenience in drilling, boring, tapping, reaming and milling for jigless production. The Automatic Positioning Layout Drilling Machine permits precision machining in hole patterns requiring ±.0002″ per foot. A single pushbutton controls positioning of table and carriage without manual adjustment. Production lots are machined at a high rate without expensive jigs and fixtures.

JIG BORERS have unexcelled precision for ultra-fine tolerances on highest quality gage, tool, die, jig and fixture work, and on jigless production. They combine stamina with precision and ease of operation for economical small lot production without layout time or jigs and fixtures. Prepositioning power rapid traverse is available on all models.

CONTACT YOUR NEARBY CLEEREMAN DISTRIBUTOR or phone, wire or write direct

CLEEREMAN MACHINE TOOL CORP.

GREEN BAY, WISCONSIN

General Distributors: The Jackson-Fotsch Company • 7350 West Lawrence Avenue • Chicago 31, Illinois

LOCKFORMER increases production 3 to 1 WITH CLEEREMAN NUMERICAL CONTROL

VISIT BOOTH 632
NATIONAL MACHINE TOOL EXPOSITION
INTERNATIONAL AMPHITHEATRE

The Lockformer Company of Chicago has achieved exceptional efficiency in drilling a Part called STANDING "S" CLEAT SIDE PLATE. This plate of 1" x 5" cold finished flat bar stock, 62¾" long, requires 122 operations.

Work was formerly done on a Radial Drilling Machine—the complete operation taking 252 minutes. Today, the Cleereman Layout Drilling Machine with the Numerical Positioning Tape Control System does the identical operations in only 84 minutes—a saving of over 66%. Three parts are completed in the same time it formerly took for one part, and scrap has been greatly reduced. Tolerances are now held on the bore to within .001" and on hole location to ± .001". In addition, Lockformer can now run shorter job lots due to quick setup time.

This is an example of the new engineering thinking at Cleereman. We've solved many problems for our customers in overcoming limitations inherent in manual positioning operations without altering the machine's purpose, versatility or basic functions.

Tedious and time consuming jobs associated with conventional positioning can now be speeded up greatly and high cost layout time is eliminated.

Let us show you how you, too, can effect a saving in your drilling operations.

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Ultra-high speed machining is a subject that intrigues many production men in metalworking. The 16-page Special Report that AM/MM published in February, 1960, sums up recent development in the technique. If you'd like a copy, send 35¢ to

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Special Reports . . .

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NEW BOOKS...

ENGINEERING: PRINCIPLES AND PROBLEMS—*By Lee H Johnson, Tulane University. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36. 318 pages. Price $5.50*

Did you ever see a photograph of 36 persons in a 6x6-ft box? If not, and assuming you're interested in seeing a photo of 36 persons stuffed into a 6x6-ft box (viewed from above; to illustrate unit loading), the book is worth the price for this picture alone (Answer: They look pretty funny—and not too comfortable).

Only a really dedicated engineering student would insist that it was pleasurable to read an engineering text, and to most engineering students, even if serious about their education, text reading is at best a chore. But this one is a snap—it's interesting, entertaining, and easy to read. The reason why is probably because the author set out to provide a first-year engineering course that actually said something about engineering, but without getting too involved and technical. The book tells what engineering is, what an engineer does, and how (roughly) he does it. To the author's credit, the book has plenty of examples, illustrations, and variety.

For example, one of the early chapters has several general prob-

lems that promote the use of common sense: "Estimate the cost of flunking one three - semester - hour course in engineering, assuming that it cannot be made up during subsequent regular semesters," or "Estimate the annual cost of owning and operating a low-priced car, driving 12,000 miles/year, including separate estimates for gasoline and oil only."

Now, with a little help from an instructor, the average student is bound to be forced to do a little thinking — not just memorizing — with questions like that. If so, it seems that this kind of course might be useful and enjoyable for any engineering students at any college.

Later on the author gets around to slide rules, equations, energy, and a lot of other technicalities—but in minor depth only—to make a well-rounded survey of engineering. A misplaced student ought to get that idea fairly soon that he won't like engineering; and a real engineering prospect should get more out of his first year in college than available from a loose confederation of sleepy lectures by assorted schools-of-engineering deans, most of whom are used to talking to captive audiences —*CDE.*

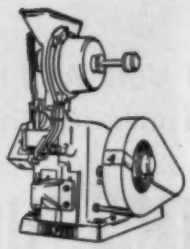
MECHANISM—*By Virgil M Faires, U S Naval Academy; and Robert M Keown (deceased), University of Wisconsin. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 332 pages. Price $7.50*

This may be a bit confusing: This is a fifth edition of "Mechanism," but it covers the same material in the earlier editions only generally; actually it nearly duplicates about 70% of the material in "Kinematics" by author Faires, with many of the same illustrations, similar organization, and often identical wording. The whole arrangement is a bit odd; the author obviously prefers his own organization of the material in preference to the old format in earlier editions of "Mechanism" — and we have to agree.

It is a standard kind of textbook on basic theory behind basic mechanisms such as cams, gears, cranks, and other elements of machines. Presumably the text is geared to a specific course in Kinematics (the same subject as Mechanism), and should be usable in many schools.

As a reference book for those not in school, it has a fairly good index, a good number of drawings, sketches,

(continued on page 474)



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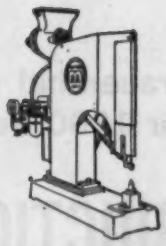

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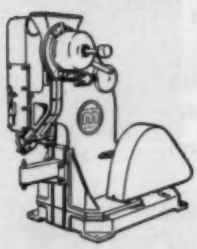

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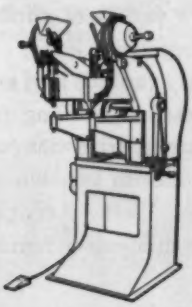

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Frauenthal reports NEW VERSATILITY for 1200 Series vertical grinder!

PRODUCTION BY THE THOUSANDS... PRECISION TO THE MILLIONTHS

Now available with NEW tracer control or numerical control... infinitely variable feed and speed ranges!

Frauenthal's flexible 1200 Series single-spindle vertical grinder permits *precision to the last millionth* on contour pieces, yet can be engineered to provide mass production grinding when required.

A new electro-hydraulic tracer control system affords super-precise accuracy. Completely transistorized for compactness and a new high degree of control reliability, the ultramodern tracer system guides the vertical and horizontal axes simultaneously through 360° of motion. Any variation from true contour path is immediately indicated on a continuous recorder which also gives a permanent record of contouring accuracy.

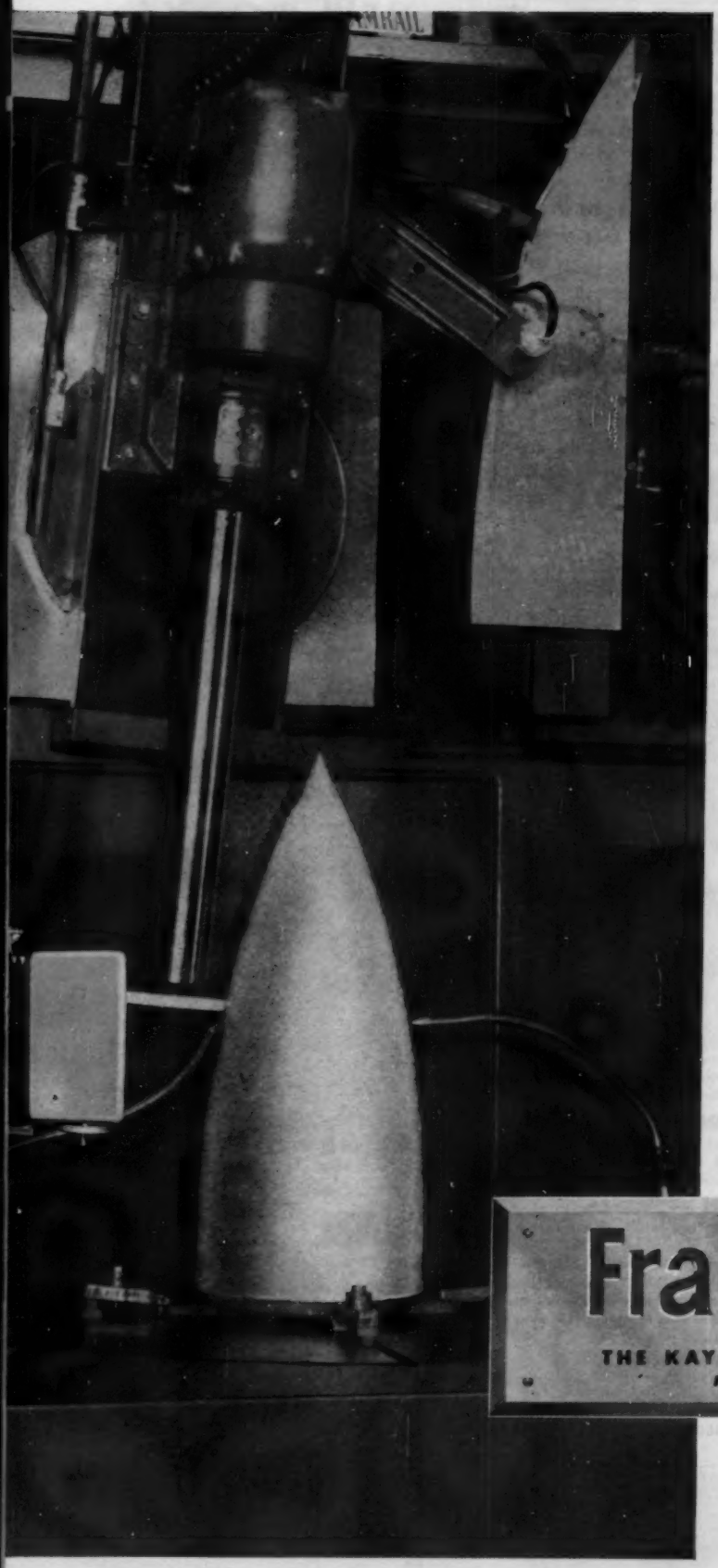
Numerical control allows continuous path or discreet positioning, and is particularly applicable for a variety of grinding operations on a low-cost repetitive basis.

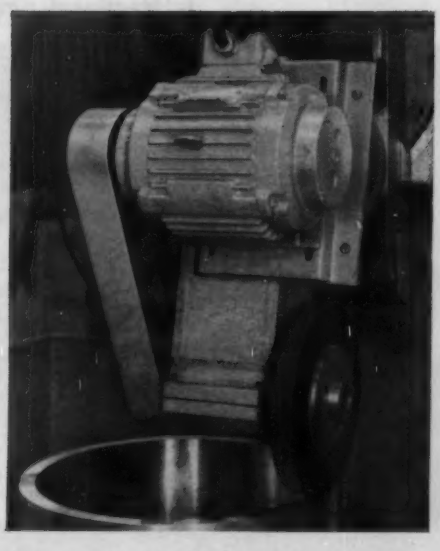
Infinitely variable feed and speed ranges with widest possible working range are available. Direct-current drive with potentiometer control assures accurate variable worktable speed.

The 1200 Series' vertical design eliminates deflection inherent in horizontal grinders. This design also substantially reduces floor-to-floor time, since parts are loaded easier, centered faster and can be simply, quickly checked.

For complete details on this creatively engineered single-spindle vertical grinder, write for the new Frauenthal 1200 Series bulletin.

There are two 1200 Series models, with table diameters from 24" to 42" and nominal swings of 36" to 48".





Here is the right-angle spindle attachment for rotary surface grinding — another new Frauenthal development for use with the 1200 Series grinder.

While you're at the MACHINE TOOL EXPOSITION in Chicago (September 6-16), be sure to visit the Frauenthal exhibit in booth 1220.

Frauenthal

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THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U.S.A.

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... of valuable production information

Your visit to AM/MM's exhibit booth at the Machine Tool Exposition can be rewarding: a selection of six important portfolios of editorial reprints will be made available (and mailed direct to you without charge) upon request.

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(PATENT PENDING)

. . . LETS YOU TURN DIAMOND TOOLS WITHOUT DISTURBING SET UP!

Every diamond tool user knows the importance of turning the diamond to keep it sharp. Sharp diamonds mean maximum accuracy and longer tool life. Turn-A-Tool's unique design permits rotation of the *entire tool* within a fixed shank. As a result, the diamond tool can be easily turned while it is securely locked in set up. With Turn-A-Tool there is absolutely no downtime . . . tool may be turned while machine is in operation! Check all the special Turn-A-Tool features listed below . . . features you only get with Staset Turn-A-Tool.

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✓ **ROTATION WITHIN A FIXED SHANK —** Because the entire tool (not just the head) of Turn-A-Tool moves within a fixed shank, you get rugged, trouble-free tool performance.

✓ **NO LOST TENSION —** Turn-A-Tool's absence of wear at the bearing surface results in constant trouble-free tension.

Get the complete story on Turn-A-Tool. Send for Staset's special "Turn-A-Tool Data Sheet" listing complete specification and pricing information.

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☐ Turn-A-Tool Data Sheet
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NEW BOOKS...

and photos, and particularly sensible and clear explanations. There are classroom problems at the end of each chapter, but no answers for the practical reader to check—*CDE.*

KINEMATICS OF MACHINES—*By Rolland T Hinkle, Michigan State University. Published by Prentice-Hall, Inc, Englewood Cliffs, N J. 353 pages. Price $7.50*

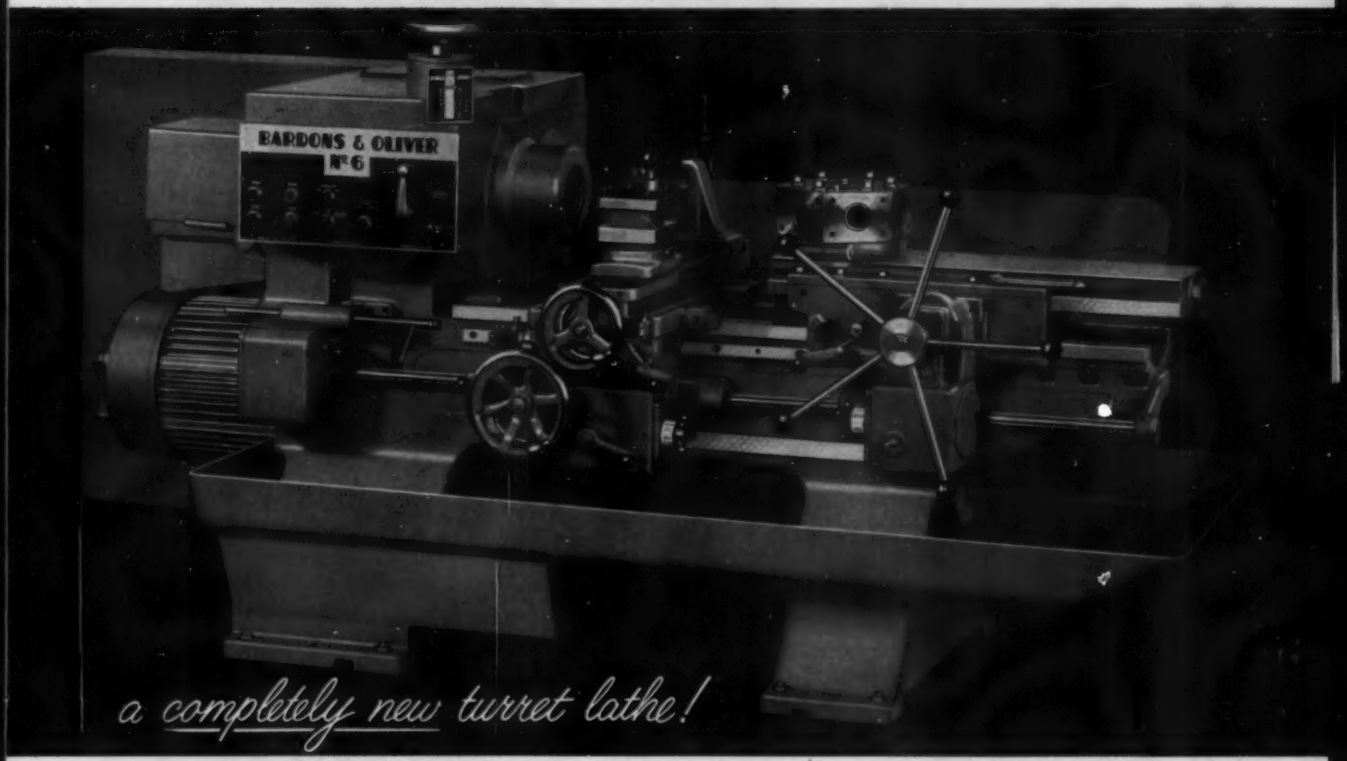
If you're curious about who uses textbooks such as this, the promotional material that came along with the book for review lists 56 colleges that have used the first edition—which tends to prove that it's a solid, authoritative, and accepted text. This is the second edition, which has been slightly revised from the first, with the addition of three new chapters. One is on dimensional synthesis, or how to analyze what kind of linkage is necessary to produce a particular kind of motion. Another is on mechanical computing mechanisms, or analog computers—and how to set them up. The third is on constrained motion, number synthesis, which means how to figure out how many links are required for a particular kind of motion.

In other respects, the text is standard work on kinematics, including material on cams, gears, links, velocity, and acceleration—the basic material of machine motion and mechanical design—*CDE.*

"I get along fine on what you pay me, sir, but my wife and family are hungry and in need of clothing."

NEW BARDONS & OLIVER No. 6
RAM TYPE TURRET LATHE

- 3 INCH COLLET CAPACITY FOR HEAVY DUTY BAR WORK
- 5 INCH COLLET CAPACITY FOR LIGHT DUTY BAR WORK
- 21⅛ INCH SWING OVER BED WAYS



a completely new turret lathe!

New bed, headstock, tool carrying units and aprons are properly proportioned and integrated to produce a truly functional lathe. It offers greater metal removal capacity, while holding today's most demanding tolerances!

In the design of this lathe, the operator was not overlooked. The number of operating controls has been reduced—grouped by function—scientifically located within easy reach. Generous use of aluminum and redistribution of weight results in improved balance and freer traverse of tool carrying assemblies.

For more information on how the new No. 6 can speed up your machining operations and build increased profits, contact the nearest Bardons & Oliver representative or write directly to our home office.

Bardons & Oliver, Inc., 1633 West 9th Street
Cleveland 13, Ohio

NO. 6 FEATURES

- Sixteen Geared Spindle Speeds—50 to 1 speed range
- Constant Horsepower (optional to 30) at all spindle speeds
- Fully Automatic spindle speed changes
- Twelve Fast Feed Changes for cross slide, carriage and hexagon turret
- Single Dial Feed Selectors on both aprons
- Power Rapid Traverse to the cross slide

BARDONS & OLIVER

MACHINE TOOL EXPOSITION MMT=PE BOOTH 741

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Manufacturers of Turret Lathes and Cutting-Off Lathes

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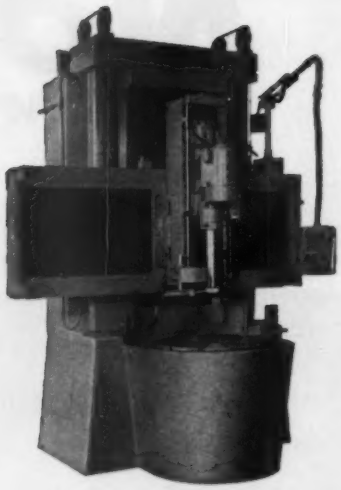
Vertical Universal Grinders



model 3-TR
52" swing

Springfield vertical universal grinders are among the most versatile tools you can use for *both* production and toolroom work. Head is easily positioned to grind ODs, IDs, surfaces, offsets and undercuts in *any* combination, generally with one chucking. Work may be regular or irregular in shape, up to 48" high with up to 52" swing on standard machines. Weight of workpiece is no problem because gravity works for you in vertical grinding — helps achieve extreme micro-inch finish and concentricity.

A typical example of a Springfield's remarkable precision is its ability to grind taper valve plugs and seats with one angle setting of the head—and get 95% blue or better on a taper gage with surface finish smoother than 30 RMS.

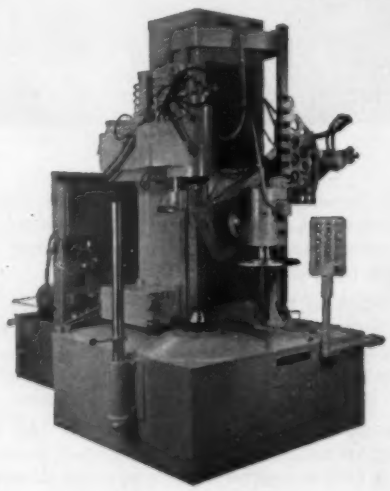
For high production, sometimes involving automatic loading, cycling, size control and unloading, Springfield builds special vertical grinding machines. Most of these can be reset when part changes occur. Another area in which Springfield has pioneered is in vertical contour grinding machines that handle missile parts.

If you would like to know more about Springfield vertical grinders, please write for Bulletin 197-G.

BOOTH 1110

MMT-PE

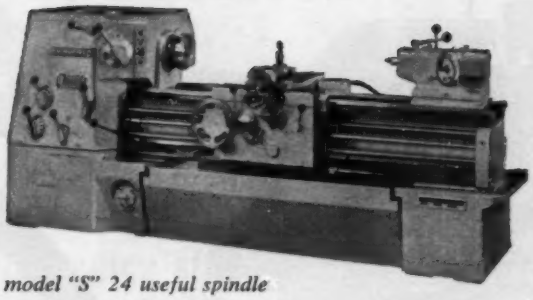
new developments coming!



vertical contour grinder

SPRINGFIELD

The Springfield Machine Tool Company
Springfield, Ohio



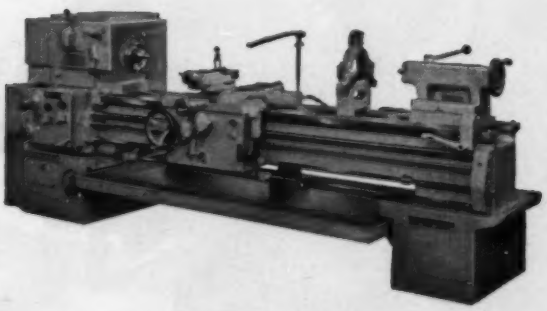
model "S" 24 useful spindle speeds, 66 feeds & threads
heavy duty 16"
medium duty 20"

Engine & Toolroom Lathes

BOOTH 1110

MMT·PE

new developments coming!



model 280 16 useful spindle speeds, 60 feeds & threads
heavy duty 14", 16"
medium duty 20"

Springfield lathes have 10, 15 or 20 horsepower motors for heavy cuts, and have simple, practical features that keep the operator productive and keep the maintenance man away. Pressurized mist lubricates the headstock. Only four gears are in mesh for a given speed—the others run free. Clean, functional design and simplified controls promote pride of workmanship and minimum waste motion.

Ruggedness with precision has always been characteristic of Springfield lathes—because they are built to *one* standard of excellence. A Springfield engine lathe meets the accuracy standards set up for toolroom lathes —without *any* cost penalty.

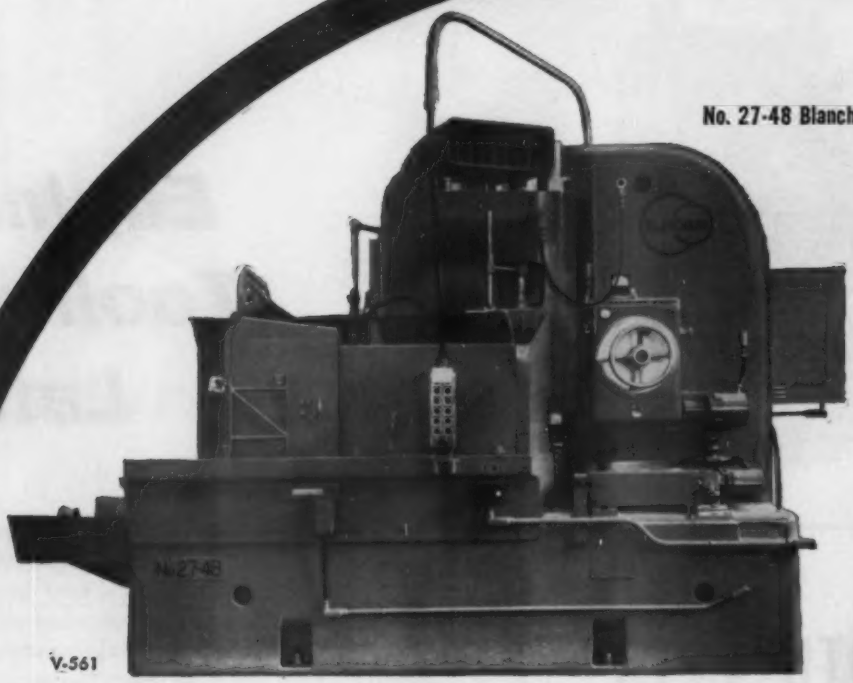
Whenever you want maximum power and efficiency, and the cost designed out by designing simplicity in, consider a Springfield lathe. A full range of attachments is available—hydraulic contouring and reproducing, plain and universal relieving, taper, etc.

If you would like to know more about Springfield lathes, please write for Bulletins 190-G and 201-G.

The Springfield Machine Tool Company
Springfield, Ohio

SPRINGFIELD

No. 27-48 Blanchard Surface Grinder



V-561

V-562

Blanchard No. 18-A2
Two-Spindle Automatic Surface Grinder

if grinding efficiency is important to you . . .

DON'T MISS SEEING THESE NEW BLANCHARDS AT CHICAGO!

Two entirely new Blanchard Grinders of advanced design will be introduced at the NMTBA Exposition in Chicago. Both machines offer new features and high production capabilities that will interest everyone whose operation requires high-speed, precision grinding.

Booth No. 1209

The No. 27-48 Blanchard Surface Grinder is an entirely new size of Blanchard Grinder. This machine will be equipped with hardened base ways, will be of "dry base" design, and will have a conveyor-type sludge tank mounted at the rear. This machine has a 48″ diameter magnetic chuck with a clearance of 52″ inside of the waterguards, 12″ vertical range and a 27″ segment grinding wheel. This grinder has a 75 HP main spindle motor. Coolant is directed both to the inside and outside of the grinding wheel. These features provide ample power, rigidity and coolant flow for heavy stock removal on a large variety of work pieces. This machine affords great accuracy, extreme flatness and fine finish.

This grinder will be equipped with a motorized Single Cut Device and a floor-mounted control panel.

Other features include: a hand-operated Trabon lubrication system for the spindle bearings, wheel dresser and head ways; automatic Bijur lubricator for the hardened base ways; and oil reservoirs for the table bearing and chuck rotation units.

The No. 18-A2 Blanchard Surface Grinder is a new Two-Spindle Automatic Surface Grinder. This new grinder is of a "dry base" design: in operation all coolant and chips flow to an outside settling tank or central coolant system. The design provides easy access to the grinding wheel area. Push button stations and operator's control are conveniently located for ease of set-up. All controls are interlocked to assure complete safety. A warning light flashes at the operator's station when grinding wheels require replacement. The grinder is equipped with 30 HP foot-type spindle motors.

The grinder has a plain table for mounting of special work-holding fixtures, and a six-speed gear box for table rotation, with provision for locking this in a pre-selected speed. The feed rate in thousandths of an inch per minute can also be locked. The grinder at the Exposition will have an eight-station fixture, each station handling a different work piece to demonstrate the ingenuity of Blanchard fixture design. This table will be rotating to demonstrate clamping and unclamping of the fixtures, and to show the path of the work pieces through the grinding wheels and under the wheel control calipers.

BLANCHARD

The Blanchard Machine Company
64 State Street, Cambridge 39, Mass.

Report to the **SMTS*** *Committee*

*SPECIAL MACHINE TOOL STANDARDS

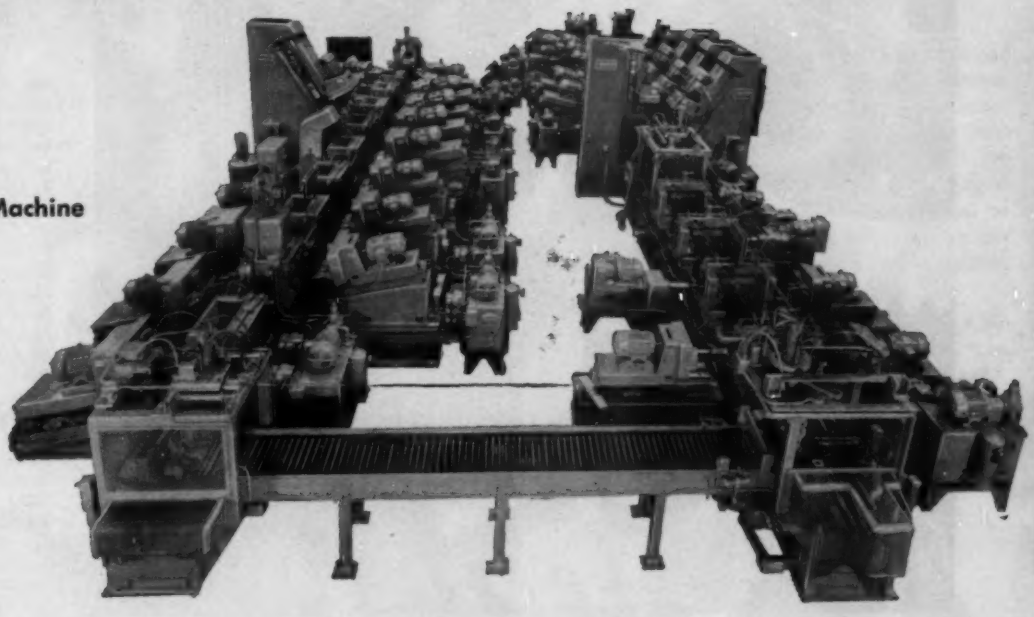
DELIVERY:

MMT-PE SEE SMTS ECONOMATICS • BOOTH 1440 MACHINE TOOL EXPOSITION

BUHR'S "BABY"

arrives on time . . .

Weight: 225 tons
Length: 220 feet
Genus: Transfer Machine



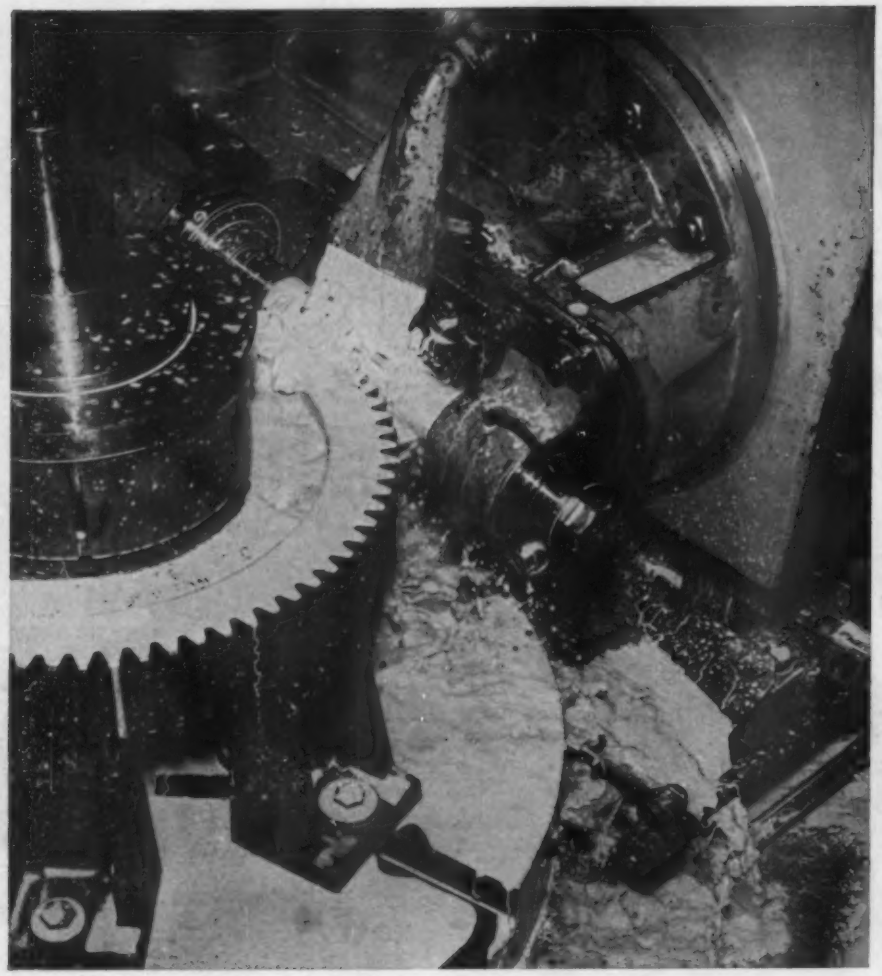
What's all the excitement about? Buhr's Baby, the first major machine built to the Special Machine Tool Standards, has been delivered to its proud owner—a major American automobile manufacturer. And it's some baby!

A lift-and-carry, part-through transfer, with fifty-eight stations, the machine is designed to perform 323 precision operations in automatic sequence on cylinder heads for a 1961 model automotive engine. Operations, in addition to rough and finish machining, include probing, sealer application, assembling, pressure testing, rejecting and injecting . . . you name it. It's fast, too. The work cycle is only 30.0 seconds. Capacity at 100% efficiency is 120 pieces per hour. It's some baby, alright! Because it was built to the new Standards, it's the most flexible and readily convertible multiple operation machine tool ever built. It's the first in a broad new line of SMTS Babies that Buhr is now building.

BUHR
(say BURE)
ECONOMATIC

BUHR MACHINE TOOL COMPANY • ANN ARBOR, MICHIGAN

CIRCLE 481 READER SERVICE CARD 481



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Improved production, maximum machine efficiency, and lower maintenance costs are vital to increased profits. A lubricant . . . the best for your purpose . . . is available for an actual production test run without cost. Kerns United, under their Memo Billing Trial Basis, recommends and supplies a lubricant for testing in your own plant . . . no formal invoice will be rendered unless completely approved in production.

Consult Kerns United now! Get the advantages of a product formulated to blend with *your own* operations.

Manufacturers of Cutting, Grinding, Drawing, Forging, Phosphatizing, Cleaning, Rope, Twine, Wire Drawing and Spray Booth Compounds; Cling Oils, Rolling Oils, Rust Preventives and Specialized Greases.

Write now for further information on any of these products—no obligation, of course.

Add your company name to this list of great names in the metal-working world who use Kerns products

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American Motors Corp.
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KERNS UNITED corporation

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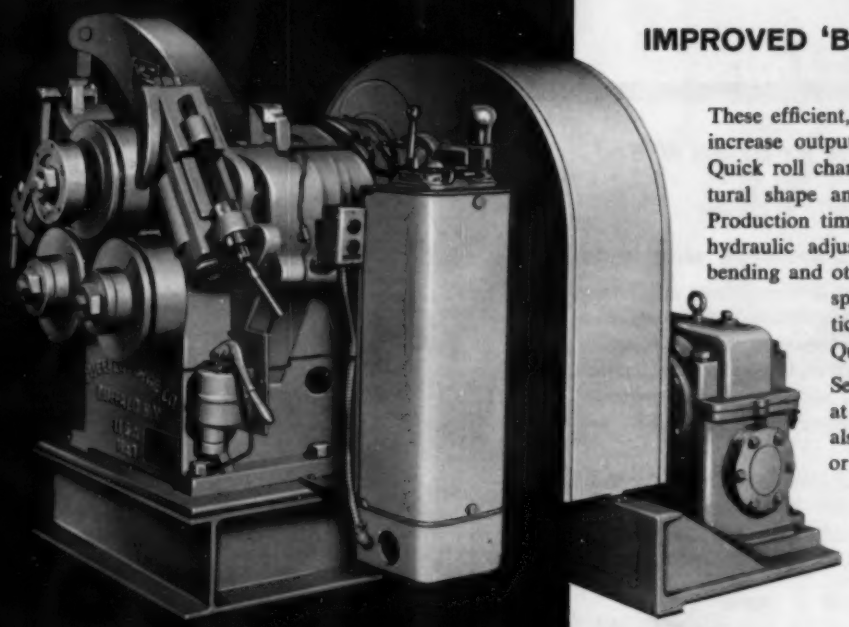
Subsidiary Plant: KERNS PACIFIC CORPORATION 630 EAST BATAVIA STREET, ORANGE, CALIF.

Representatives in Principal Cities



IMPROVED 'BUFFALO' BENDING ROLLS

These efficient, sturdily-built machines will cut costs and increase output in your production bending operations. Quick roll changes speed bending of almost every structural shape and size into circles, segments or spirals. Production time can be further reduced up to 30% by hydraulic adjustment on upper roll (optional). Leg-in bending and other specialized jobs are easily handled by special rolls. Choose from horizontal or vertical models in a wide range of capacities. Quality construction assures long life.

See demonstration of 'Buffalo' Bending Rolls at the Machine Tool Exposition. You can also call in your nearby machine tool dealer, or write us direct for Bulletin 352.

See 'BUFFALO' machine tools in action at the Machine Tool Exposition, 1960... BOOTH 551

ESTABLISHED 1877
"Buffalo"
MEMBER N.M.T.B.A.

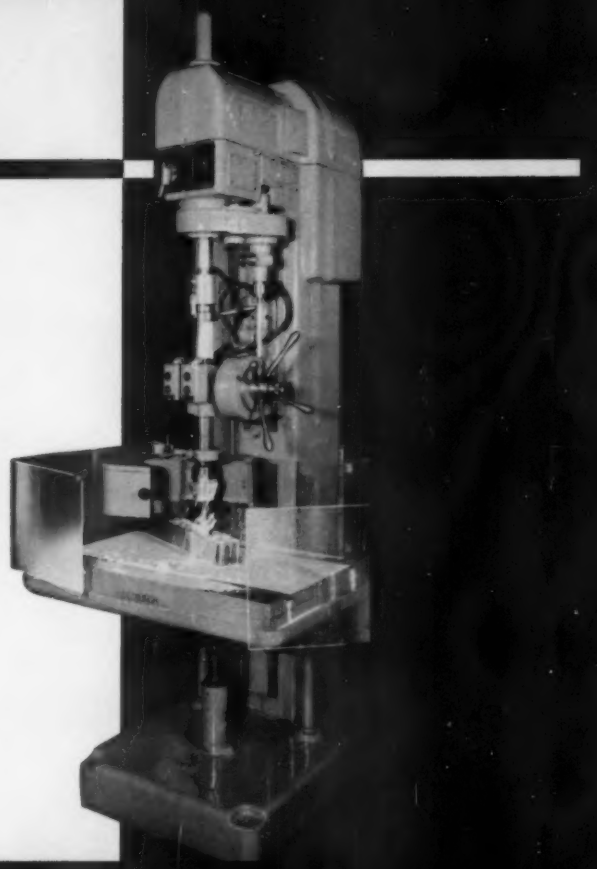
SEE THEM IN OPERATION... BOOTH 551

NEW 'BUFFALO' HOLLOW SPINDLE DRILLING MACHINES

Now you can handle formerly "impossible" drilling jobs at production speeds. Successfully drill super-hard titanium, stellite, rene 41, stainless and other exotic metals — quickly and cleanly with the incomparable 'Buffalo' Hollow Spindle RPMster and #18 drilling machines. Coolant flow through spindle, instant speed changes and extra-rugged construction let you realize full potential of hollow "Cold-Point" drills and diamond core bits.

The results are amazing. Productivity increases range to more than 300% in actual production runs. See the new 'Buffalo' Hollow Spindle machines drilling exotic metals and ceramics at the Machine Tool Exposition. We will test-drill a sample of your hard-to-drill metals. Just bring it to the show.

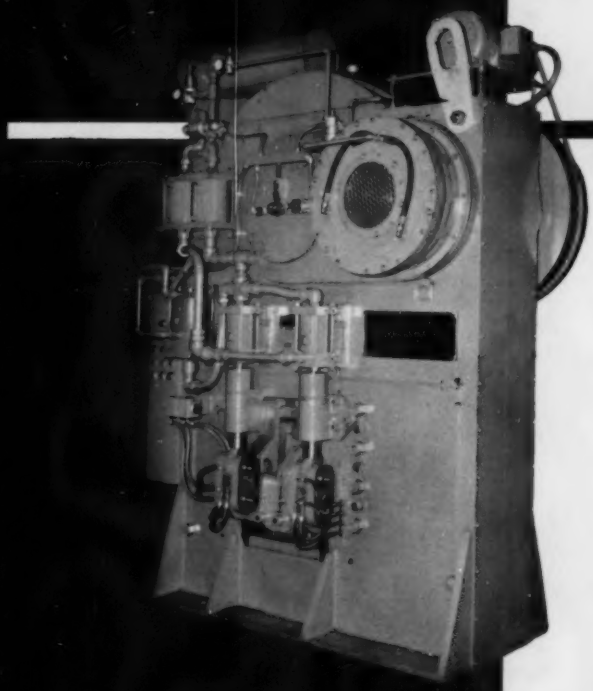
Details available on request.



COMPANY 490 Broadway • Buffalo, N.Y.

Co., Ltd., Kitchener, Ont.

SHEARING • BENDING



NEW FOR THE MACHINE TOOL EXPOSITION-1960

NEW 'BUFFALO' 400 BILLET SHEAR

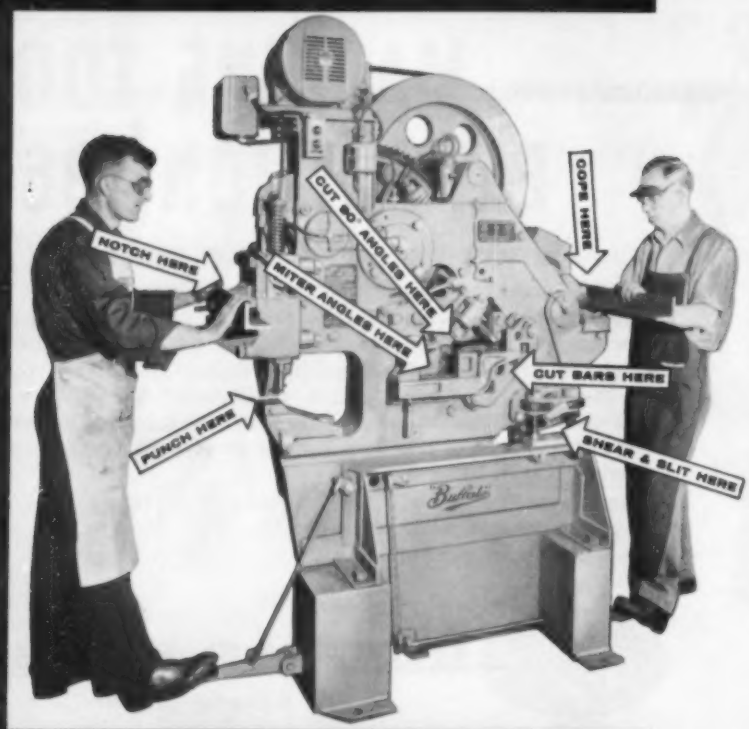
For high speed production billet cutting. Continuous operation at full capacity (within its rating) on any shearable material. Handles mild steel squares to 4", rounds to 4½". Speeds up to 60 strokes per minute. Ram tonnage: 400 tons. Machine stroke: 2". Quick, easy knife changing — both knives are removable from rear. Potential of 18,000 cuts per 8 hr. shift on automatic basis. Welded alloy steel frame has guaranteed minimum strength of 65,000 psi. Push button or foot-operated electrical control. Positive pneumatic oiling system.

The new 'Buffalo' 400 Billet Shear in operation will be one of the most exciting exhibits at the Machine Tool Exposition. See it there . . . write direct for complete facts . . . or call your machine tool dealer.

BUFFALO FORGE

Canadian Blower & Forge

DRILLING • PUNCHING



QUALITY-BUILT 'BUFFALO' MACHINE TOOLS

See Them at the Machine Tool Exposition – 1960

BOOTH 551

SEVEN OPERATIONS – SAME MACHINE

A 'Buffalo' Universal Iron Worker will speed your production and maintenance jobs — cut costs — turn losses into profits.

It can do all the jobs shown — several at the same time — many without changing tools.

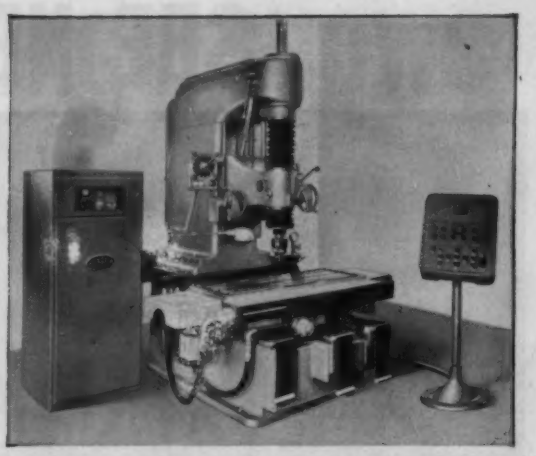
This versatile, space-saving machine is quality-built to assure long life with minimum maintenance.

It is available in models and sizes to suit your needs.

Thousands of users call the 'BUFFALO' U. I. W. the most useful machine in their shops. Perhaps you will, too. See it in action at the Machine Tool Exposition. If you're in a hurry for full details, contact your machine tool dealer — or write direct for Bulletin 322.

Sperry turns back the point of no return!

Tooling costs . . . up. Labor costs . . . rising. If the total cost of producing your product is reaching the point of no return, you can do something about it.



Jobs formerly requiring precision jigs can now be run directly on this #65 automatic production Jig Borer by W.B. Knight Machinery Company. Positioned by Sperry Tape Control, extreme accuracy and speed is maintained constantly through the use of hydraulic cylinders and linear transducers.

SPERRY NUMERICAL MACHINE TOOL CONTROL saves thousands, in tooling...and labor!

See it in action at the

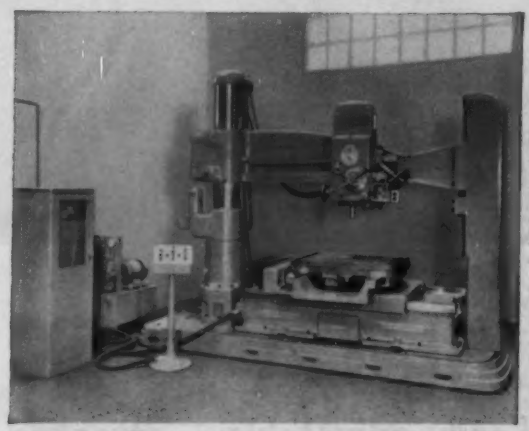
MACHINE TOOL EXPOSITION

CHICAGO, ILLINOIS . . . and discover for yourself how Sperry Numerical Controls can apply to **your** production problems. You'll see some of the finest machine tools made — operating under the fast, accurate direction of Sperry Numerical Control.

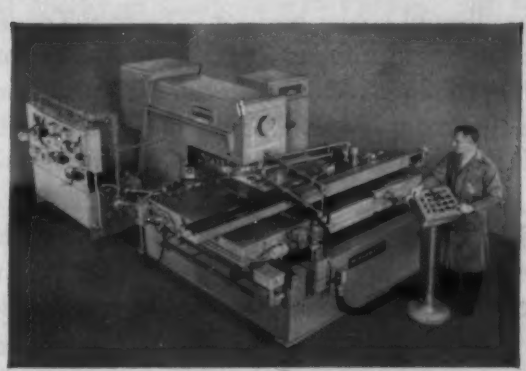
If you cannot attend, further information can be had by writing to:

SPERRY

SPERRY GYROSCOPE COMPANY OF CANADA, LTD.
NUMERICAL CONTROL DIVISION
6011 Cote de Liesse Road, P.O. Box 710, Montreal, Que.



The American Tool Works Co., Boring and Drilling Machine with Ultra-Precision 30" x 30" Positioning Table shown here, provides a large, rugged work capacity and Jig Borer accuracy. Sperry Numerical Control positions both axes at high speeds, simultaneously.



No templates or manual settings on this Wiedematic turret punch press. Produced by Wiedemann Machine Co., operation is fully automatic under the command of Sperry Numerical Control. With Sperry Tape Control, table positioning and turret cycling is extremely rapid, and permits accurate punching of holes at a very high rate of speed.

Manufactured in the U.S.A. by Wheeler Electronic Corp. Sub. of Sperry-Rand Corporation

SEE NEW KENNAMETAL*

Easy adjustment, regardless of tool position. Just release the clamp and "dial" the breaker to any position desired.

NEW KENDEX* DIAL-A-BREAKER

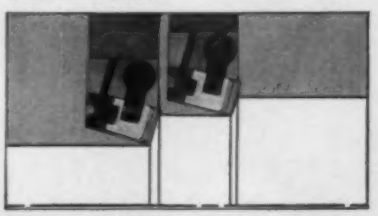
Easily adjustable...attached chipbreaker

Quickly, easily . . . set the chipbreaker where you want it, regardless of holder position. The new Kendex Dial-A-Breaker eliminates fumbling and fussing while changing and adjusting chipbreakers and inserts. Chipbreaker is brazed to its adjustment screw. It can't fall out, and the breaker setting is retained while indexing or changing inserts.

You no longer need a different breaker for every cutting job. Just turn the dial and position one chipbreaker for several jobs. Minimum of parts to stock . . . only two chipbreakers required for 70 styles and sizes of holders.

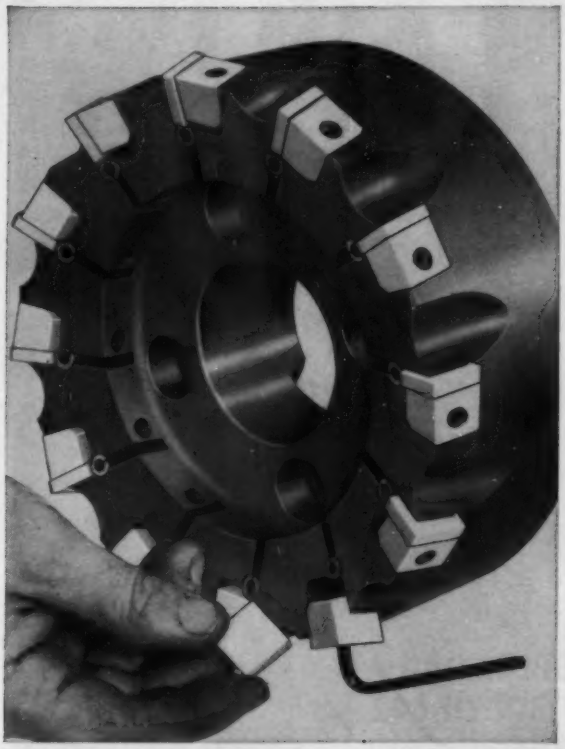
Kendex Dial-A-Breaker Tool Holders have the same basic design and accommodate the same solid Kennametal shims and "throw-away" inserts as used in standard Kendex holders. They are available in positive or negative rake, and with square or triangular inserts.

Holders with clamps and chipbreakers removed to show positive seating of both triangular and square inserts. Tool can be used without chipbreaker if desired.

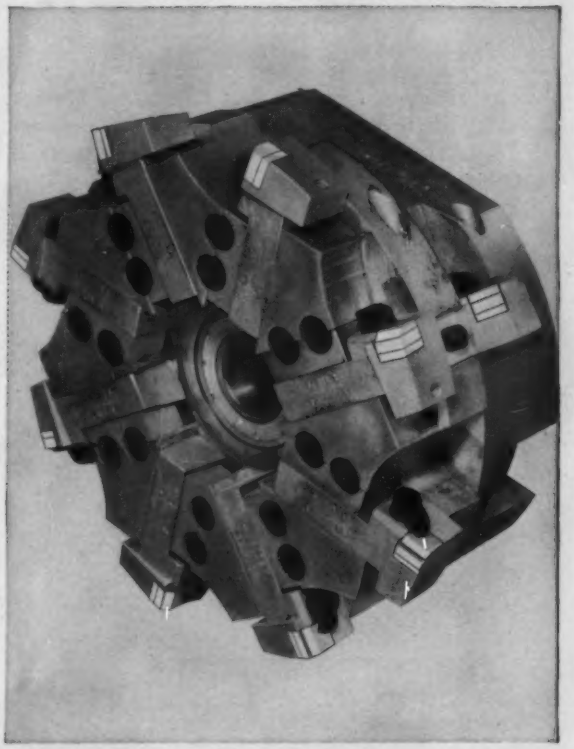


All adjustments, chipbreaker and insert, can be made from the top of the holder. Permits close ganging of tools. (Clamp screw is also accessible from the bottom of tool when mounted in an inverted position on the rear carriage.)

TOOLING AT CHICAGO SHOWS



Retracting the wedge, by means of a double-end screw, quickly releases the inserts. Held in by the screw, the wedge cannot fall out, regardless of the cutter body position.



Multiple insert Kendex head enables a major automobile manufacturer to bore and chamfer brake drums in one pass. Cutting edges can be indexed in a few minutes.

NEW KENDEX MILLING CUTTER

uses "throw-away" inserts

No grinding, no blade resetting! Each ¾-inch square Kennametal insert provides eight separate cutting edges. When one edge becomes dull, the clamp is released and the insert given a quarter turn to a new, sharp edge. It is then reclamped, without need to reset or gage the tool. When all eight edges (four on each side) have been used, the insert is replaced by a new one.

With a heavy cutter body . . . and more than ⅝-inch of solid Kennametal backing up each insert . . . new Kendex Milling Cutters are built for the rugged service necessary for fast metal removal. The one-piece cutter body is made of heat treated steel. A 15-degree corner angle minimizes pressure on the workpiece. Solid Kennametal wedges and seats provide close-tolerance, positive positioning of the insert . . . to permit maximum utilization of available power.

*Trademark 33527

SPECIAL KENDEX "DESIGN-AND-BUILD" SERVICE

combines 2 or more operations in 1 pass

When "standard" tooling won't do the job . . . we will design and build tooling that *will* . . . such as special Boring Bars, Boring Heads, Multiple Tool Block Tooling, Hollow-Mill Tooling. Some examples of these Kennametal "specials" will be on display at the Chicago Shows.

SEE US IN CHICAGO

MACHINE TOOL BUILDERS SHOW
International Amphitheater—North Hall
Second Floor—Booth 1500—Adjacent to Restaurant

PRODUCTION ENGINEERING SHOW
Navy Pier • Booth 111

SEPTEMBER 6-16

INDUSTRY AND **KENNAMETAL**
*...Partners in Progress**

6 precision spindles by Avey

The reliability of the Avey 250 Turret-Dex matches the quality of the thousands of Avey drilling, tapping, and production machines which preceded it. It is available as either an automatic machine or numerically-controlled with rotary or two-axis positioning table. Pre-selected speeds, feeds, rapid advance, and tapping cycles. Automatic depth control for all spindles.

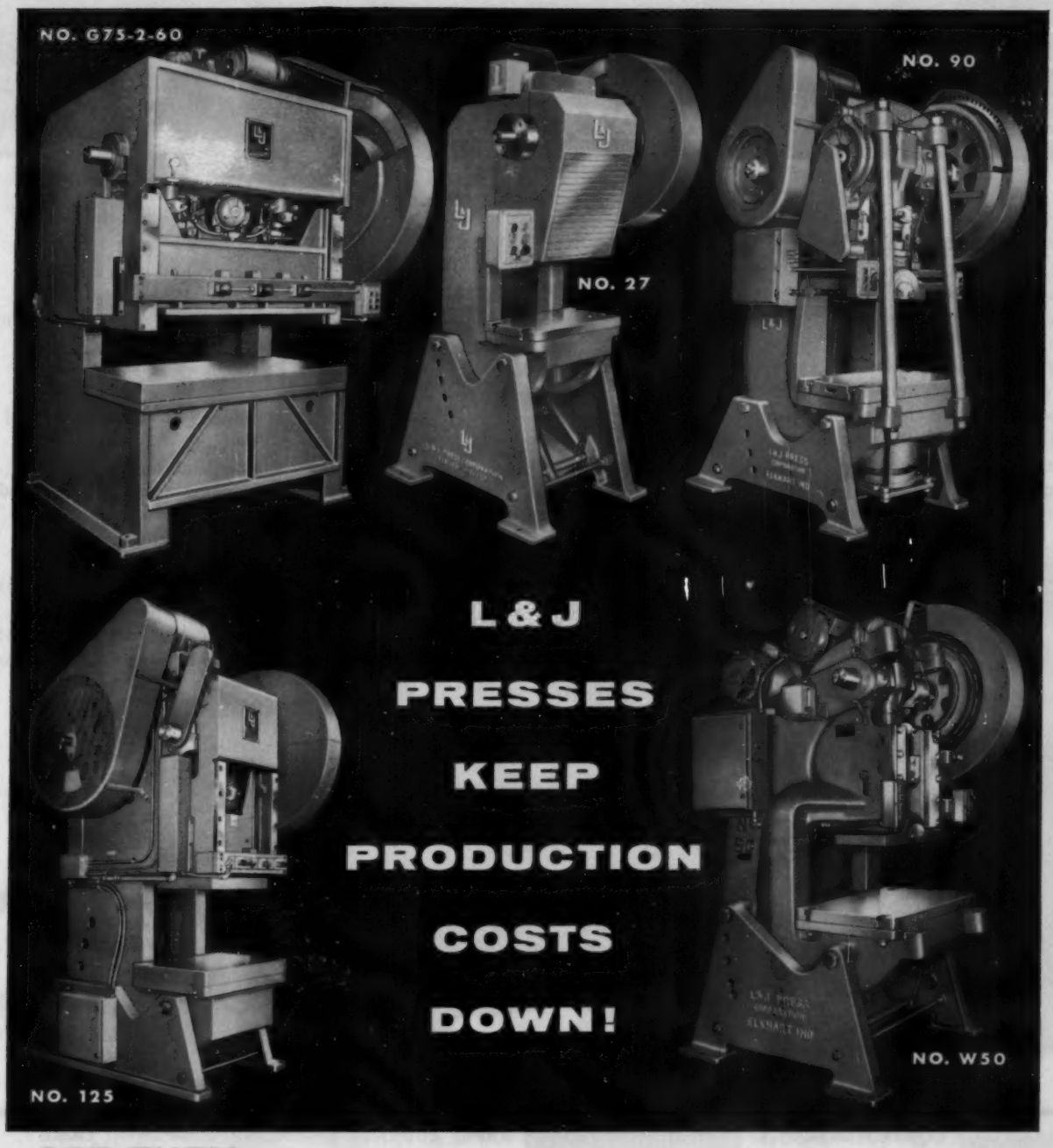
All spindles may be skip indexed. Automatic turret clamping. Positive spindle location. Rigid one-piece spindles, mounted in "O" precision taper roller bearings. Capacity up to 1¼" in steel.

The Avey Turret-Dex makes it more clear than ever that, for your drilling requirements, "Avey makes the right one for Avey makes them all." The Avey Division, Motch & Merryweather Machinery Co., Box 1264, Cincinnati 1, Ohio.

Write for catalog 460

Avey

OPERATING AT BOOTH 822 MACHINE TOOL EXPOSITION 1960



SEE THEM

in action at
N.M.T.B.A. Exposition —
International Amphitheatre.

When you have to take a second look at production costs, it's time to look at today's L & J Presses. Their modern design is based upon actual experience in meeting today's requirements in user's plants. You'll find their efficiency, dependability and accuracy bring lower production costs.

There is a type and size to meet a majority of press requirements. O.B.I. Presses are available in 14- to 150-ton capacities, Straight Side Presses in 20- to 150-ton capacities and Gap Frame Presses are made in 30- to 75-ton capacities. Optional equipment is available for specific tooling requirements. *Write for new catalog.*

L & J PRESS CORPORATION, 1629 STERLING AVENUE, ELKHART, INDIANA

EDLUND-MATIC NUMERICAL TAPE CONTROLLED DRILLING & TAPPING MACHINE

The newest Layout Drilling Machine with Numerical Tape or Dial Control. Economically performs multiple operations for Single Piece Layout Work Short Run Production
The entire sequence of operations can be repeated time after time with no chance of operator error—minimizes operator attendance and skill.

FEATURES

- Flexibility in setting up a wide variety of operations.
- Quick conversion from one drilling job to another.
- Work from standard detailed drawings.
- Standard 1" 8 channel punched tape.
- Tape or Dial control.
- Infinitely variable spindle speeds 225-2700 rpm.
- Infinitely variable feeds 1 to 7 inches per minute.
- Nine different operations or tool changes at one setting.
- Foolproof tool rack (available) prevents use of incorrect tool.

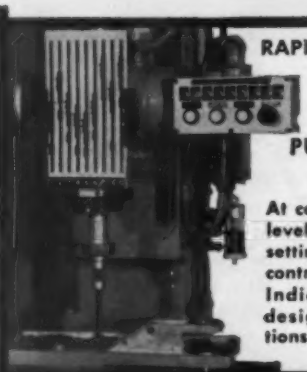
See this new Edlund machine at the National Machine Tool Exposition SPACE 531

◆ PATENTS PENDING

Write for Bulletin 200.

CONTROL CONSOLE

Operation Selector Switch and Lights for nine operations
Spindle Speed and Feed Setting Knobs and Tachometers.
Table Positioning Dials for two axiis.
Zero Offset Dials.



RAPID ADVANCE AND FEED STOPS PLUS PENDANT PUSH BUTTON STATION

At convenient eye level for precision setting and easy control.
Indicator Lights designate operations.

EDLUND COMPOUND TABLE

A new concept in extremely rapid positioning table. Many exceptional features. Table Travel 14" x 20". 200"/per min.

Special Contract Job work can also be arranged with Edlund. Send Part, Blueprint and Requirements.

EDLUND
MACHINERY COMPANY
Cortland, New York Division of Harsco Corporation

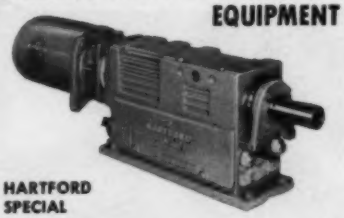
EDLUND REPRESENTATIVES IN MAJOR CITIES

DOERR® MOTORS

HELPING HAND

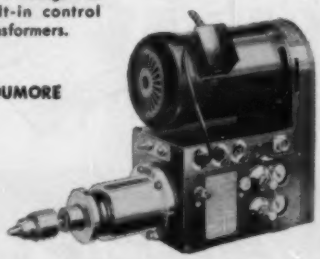
to so many famous names in the metalworking machine industry!

DRILLING and TAPPING EQUIPMENT



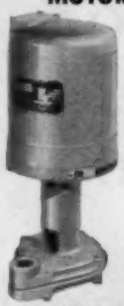
HARTFORD SPECIAL

These heavy duty jobs require features such as rapid reversal, high torques, multi-speed design, and special windings with built-in control transformers.



DUMORE

COOLANT PUMP MOTORS

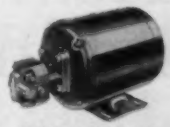


BROWN & SHARPE

INGERSOLL-RAND

Typical streamlined Doerr designs with features to resist effects of splashing cutting oils.

HYDRAULIC PUMP MOTORS



JOHN S. BARNES

Shown are three of the several makes of hydraulic pumps on which Doerr motors are available. Used for tracer mechanisms, forced lubrication and table drives.

TUTHILL

SPENCER HYDRAULICS

ADJUSTABLE-SPEED DRIVES

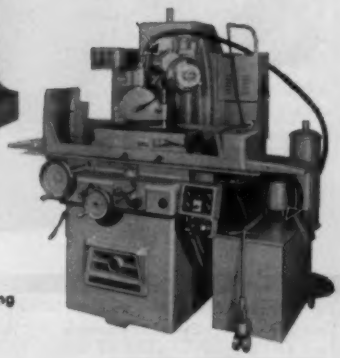
Both are available with Doerr motors. Used on a wide variety of feed and grinder drives.

DYNAMATIC AJUSTO-SPEDE

GRAHAM TRANSMISSION

MACHINE TOOL AUXILIARY DRIVES

KEARNEY & TRECKER
DIE MILLER
Can use six Doerr motors when fully equipped.



GALLMEYER & LIVINGSTON MODEL 350 SURFACE GRINDER

With Doerr motors on elevating head and coolant pump.

DOERR EXPERIENCE AND WILLING COOPERATION CAN SOLVE YOUR PROBLEMS

SPECIAL APPLICATIONS like these call for competent help from someone *able* and *willing* to take a genuine interest in working out practical motor designs. DOERR motors find their way into hundreds of machine tool designs . . . directly by the manufacturer or on some motorized component.

All of this did not happen overnight. Our acceptance is the result of many years of intensive interest in this field. Doerr would like to work with you on your motor requirements.

NEW 14-PAGE CONDENSED CATALOG—And motor "idea book." Write today for your copy.

DOERR
Electric Corporation

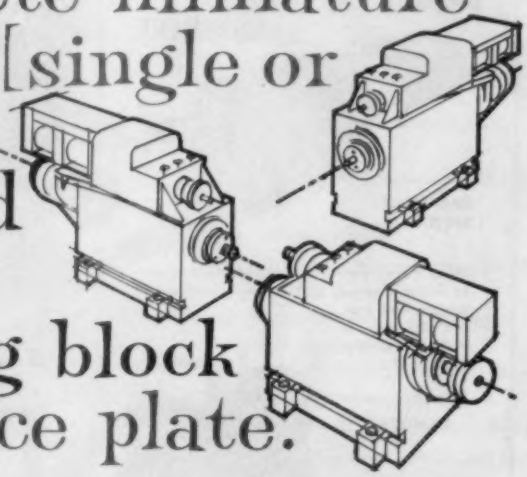
510 N. Fourth Ave.
CEDARBURG • WISCONSIN
Phone: DRake 7-0500

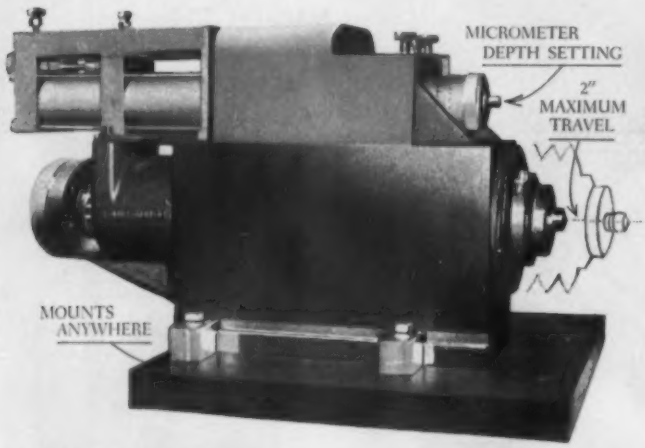
SPECIFY DOERR MOTORS!

◄ CIRCLE 933 READER SERVICE CARD

CIRCLE 934 READER SERVICE CARD

For instrument and small-parts industries: complete miniature boring machine [single or multi-directional] can be assembled with this unit as a basic building block applied to a surface plate.

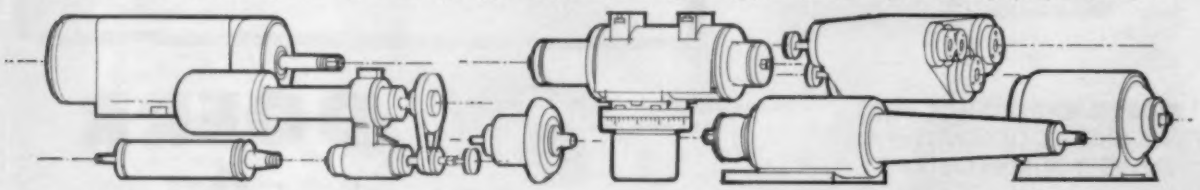




Whitnon

Reciprocating boring spindle, with fast infeed, controlled boring feed, and dwell time all precisely variable • Rotational error is less than .00003" (30 millionths) • Micrometer depth control repeats to within .0002" • Travel error less than .00005" (50 millionths) in the entire 2" maximum travel. For all industries which need precision miniature boring *plus* quantity production, this new Whitnon spindle bores at speeds of 1000 to 15,000 rpm, with every detail of its performance under precise control. Modifications to suit particular functions can be provided, as well as alternate drives and mounting details. Further information, performance data, and consultation are available — no obligation.

Specialists in precision revolving machinery, Whitnon offers precision spindles for boring, milling, grinding and drilling, custom designs for special functions.



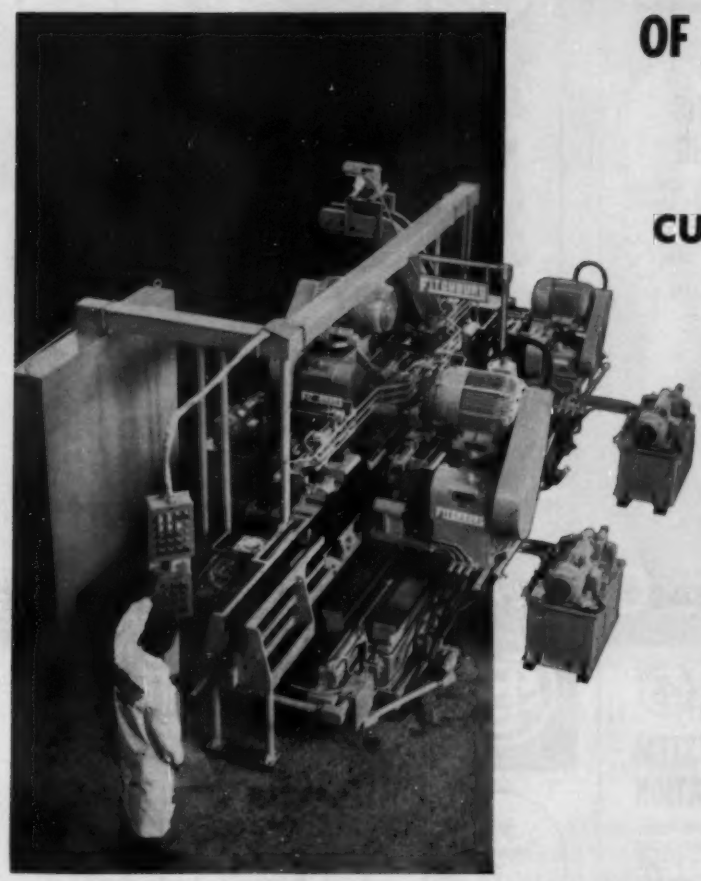
THE WHITNON MANUFACTURING COMPANY, ROUTE 6 AND NEW BRITAIN AVENUE, FARMINGTON, CONNECTICUT

FITCHBURG.....

DESIGNERS AND BUILDERS

OF SPECIAL MILLING AND BORING MACHINES

AND OTHER CUSTOM-BUILT MACHINERY



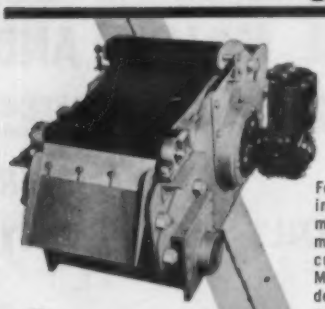
This Special Fitchburg 5-Station Automatic Transfer Machine was designed and built for rough milling the top and bottom and finish milling the top of Diesel engine cylinder heads. The machine is adjustable to accommodate two lengths of cylinder heads. A special ejection mechanism unloads the work sideways and places it on a conveyor at an angle in such a manner as to prevent the machined parts from falling over sideways. Two 40 H.P. Fitchburg self-contained milling units perform the rough operations while a 15 H.P. unit takes a second cut on the top surface. All fixtures and transfer mechanism are fully automatic and hydraulically operated. This machine features retractable quills with power-operated quill clamps that operate when the quills are in working position.

Fitchburg engineers would be glad to study your production problems and offer equipment designed and built to improve your product, increase production, and cut costs. Special machinery is standard with us. Write for catalogs showing many custom-built machines we have produced.

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS, U.S.A.

GALE OFFERS 5 COOLANT CLEANING AND OIL SEPARATION EQUIPMENT for the metalworking industry

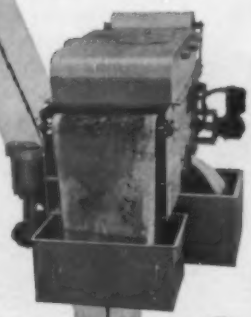


1 MAGNETIC CLEANING

Ferrous metal particles produced in grinding, honing and other machining operations are removed from any type coolant or cutting oil by the "GALE" Magnetic Separator. Solids are delivered near-dry for easy disposal.

2 NON-MAGNETIC CLEANING

Ferrous and non-ferrous metals as well as non-metallic solids are removed from coolant liquids with equal efficiency by the IMPINJO® Filter. An automatically controlled moving filter medium simplifies disposal of waste solids.

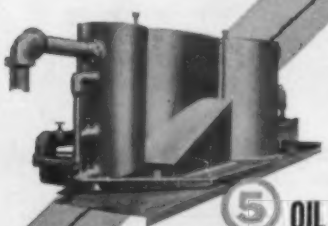


EXTRA FINE CLEANING 3

Grinding and polishing to a low micro-inch finish requires abrasive-free recirculating coolants. Diatomaceous filtration removes surface-damaging micronic and colloidal solids. Recommended for aluminum rolling oils and other industrial filtering problems.

4 CENTRAL SYSTEM PURIFICATION

Centralized cleaning to serve many machines using the same coolant is accomplished by flotation and sedimentation. The SEDI-FLOTOR® Clarifier is available in capacities for any coolant flow requirement.



5 OIL SEPARATION

Free un-emulsified oil and grease contamination in liquids is eliminated by the "GALE" Interceptor-Separator. Oils are removed and separated liquid is discharged.

The GALE Separator Co. is a Division of INFILCO Inc., world leaders in liquid treating equipment.

GALE SEPARATOR Co.

GOSCO

P. O. Box 5033 • TUCSON, ARIZONA

Please send information on (1)__ (2)__ (3)__ (4)__ (5)__

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

CIRCLE 937 READER SERVICE CARD

HOLD IT... Mister!

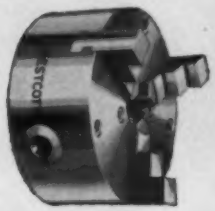
WITH A

WESTCOTT CHUCK

Top Quality Chucks Since 1872

HEADQUARTERS for SPECIALIZED CHUCKING PROBLEMS

- Engineering Know-How
- Complete Facilities
- Precision Standards
- Ship from Stock
- Satisfaction Guaranteed



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400 E. WALNUT STREET • ONEIDA, NEW YORK

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The Answer... TO INDUSTRY'S DEMAND FOR QUALITY, EFFICIENCY AND LOW COST ECONOMY

UNITED STATES ELECTRICAL GRINDERS-BUFFERS

An investment in better, faster, production through the use of tools expertly designed and conscientiously crafted for your particular purpose.

General Purpose Grinder

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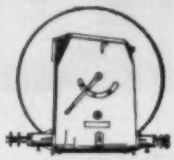
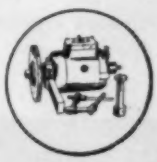


Buffer and Polisher

Precision Lathe Grinder



Tool Post Grinder

Grinder and Buffer

"OVER 60 YEARS SERVICE TO INDUSTRY" WRITE FOR CATALOGS

The United States Electrical Tool Co.

3640 LLEWELLYN ST., CINCINNATI 23, OHIO

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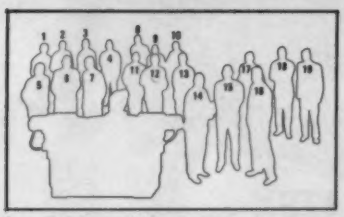
See You in Chicago!



1 C J Hanrahan, asst. supt.
2 D A Piper, product engineer
3 W Szacik, eng. supervisor
4 J N McHoul, sales engineer
5 E J Patria, superintendent
6 C R Adams, chief sales engineer
7 H J Gaseau, sales engineer
8 R D Swahnberg, sales engineer
9 J R Jarest, asst. chief eng.
10 H N Langley, applications eng.
11 R R Grover, development eng.
12 C B Clark, chief engineer
13 A F Anctil, eng. supervisor
14 R B Vaughan, sales manager
15 G Swahnberg, president
16 E J Kingsbury, chairman
17 E R Guilbeault, mach. operator
18 H M Frechette, v. p. & gen. mgr.
19 E J Kingsbury Jr, v. p. & treas.

not shown in photo
N J Stankiewicz, service mgr.
A H Knight, sales engineer
C E Loos, electrical engineer
C O Snow, asst. to the supt.

3 Automatic Indexing Machines Show How to Combine a Variety of Operations

Here in booth 731 of the Amphitheatre is equipment that is unexcelled for high production drilling and tapping work to close tolerances. Here too are attachments for performing a variety of operations in the same chucking of the work.

All of us plan to be here (but don't worry, not all at once). And we want to show you . . .

— 3 automatic indexing machines

— 8 different models of automatic drilling and tapping units

— 11 different head attachments for a variety of operations — boring, milling, recessing, oscillating, angular feed, speeder, planetary speed reducer, etc.

— other accessories — two-position hydraulic slide, coolant distributor, bushing carrier, etc.

Left — a fairly simple setup with 20-inch index table and three automatic drilling and tapping units.

Rear — a large setup with 63-inch index table and a center column that supports ten units. Seven units are mounted on wing bases. Suitable for many operations.

Right — a new basic machine with 40-inch index table and no center column. This new addition fits into our line between the other two types.

These machines have no special tooling, but we will be glad to talk to you about designing, building and tooling a machine all ready to produce for you.

See you in Chicago! Kingsbury Machine Tool Corp., Keene, N. H.

KINGSBURY

CIRCLE 940 READER SERVICE CARD

Now—EASTERN'S Flying Freighters offer

OVERNIGHT DELIVERY

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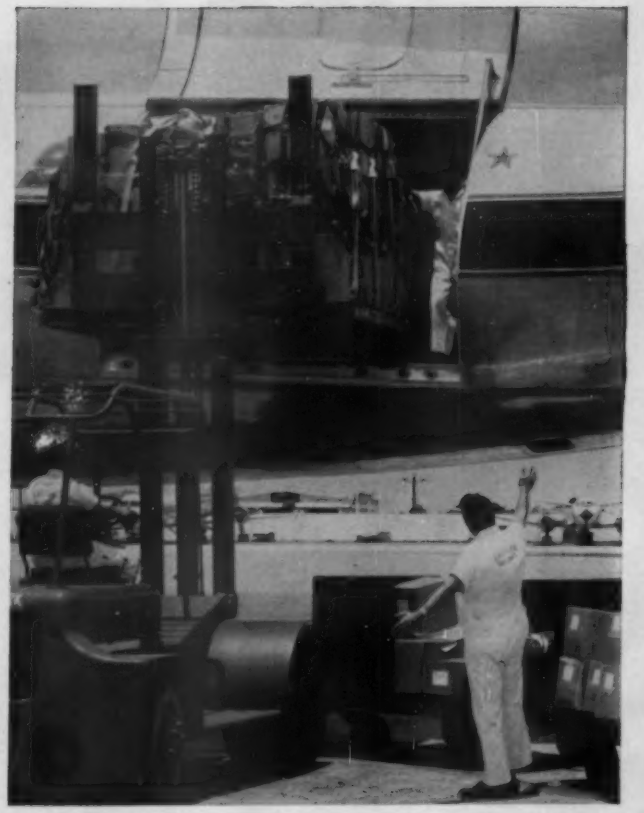
- Reserved space on every Freighter flight.
- Pressurized and temperature-controlled.
- Flights daily except Saturday and Sunday nights.
- Pickup and delivery service available.

In addition, Eastern offers freight space on over 400 daily passenger flights—including DC 8-B Jets and Prop-Jet Electras—to 128 cities in the United States, Canada, Bermuda, Puerto Rico and Mexico.

For Information and Freight Reservations, call your Freight Forwarder, Cargo Agent or Eastern Air Lines.

EASTERN AIR LINES



CIRCLE 941 REARER SERVICE CARD

2746

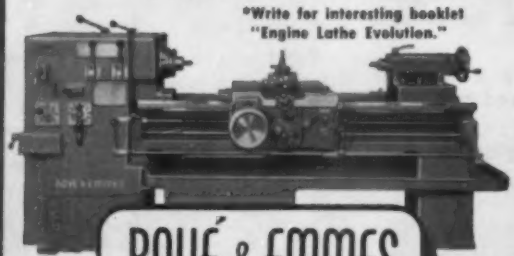
SINCE 1895

BOYE AND EMMES LATHES TURN COSTS DOWN*

1895	Single Back Gear Cone Lathes
1900	Quick Change Gearbox
1910	Double Back Gear
1920	All Geared Headstock
1930	Anti-Friction Bearings
1940	Steel Vees — High Speeds
1950	Tracer Controlled

1960 Ask about it
Write about it
Come see it

*Write for interesting booklet "Engine Lathe Evolution."



BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
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MACHINE TOOL CENTER of the WORLD

ANNOUNCING

The new CRATEX
TOOL & DIE MAKERS KIT

The world's finest rubberized abrasives for deburring, smoothing and polishing tools, dies, patterns, molds, models, instruments and component parts.

Kit contains 80 wheels and points in the most popular sizes and shapes, equally assorted in four grit textures, coarse (C), medium (M), fine (F), extra fine (XF)... plus four mandrels for ¼" chuck... packaged in plastic box, compartmented for fast selection. $7.50 complete.

Order your new Cratex Tool & Die Makers Kit #777 through your distributor—or, send your order to us for delivery by the Cratex distributor nearest you.

CRATEX *Free 8-page catalog available on request.*
MANUFACTURING CO., INC.

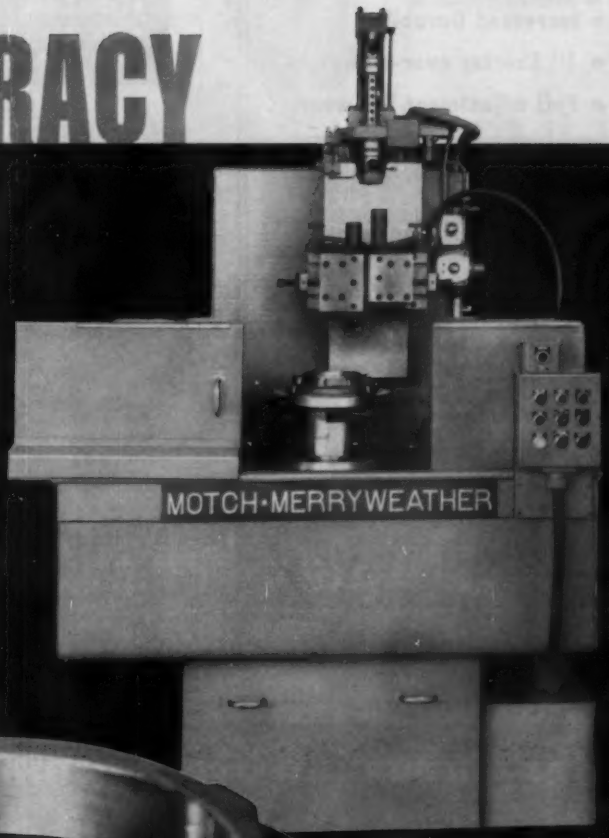
1600 ROLLINS ROAD, BURLINGAME, CALIFORNIA

CIRCLE 942 READER SERVICE CARD

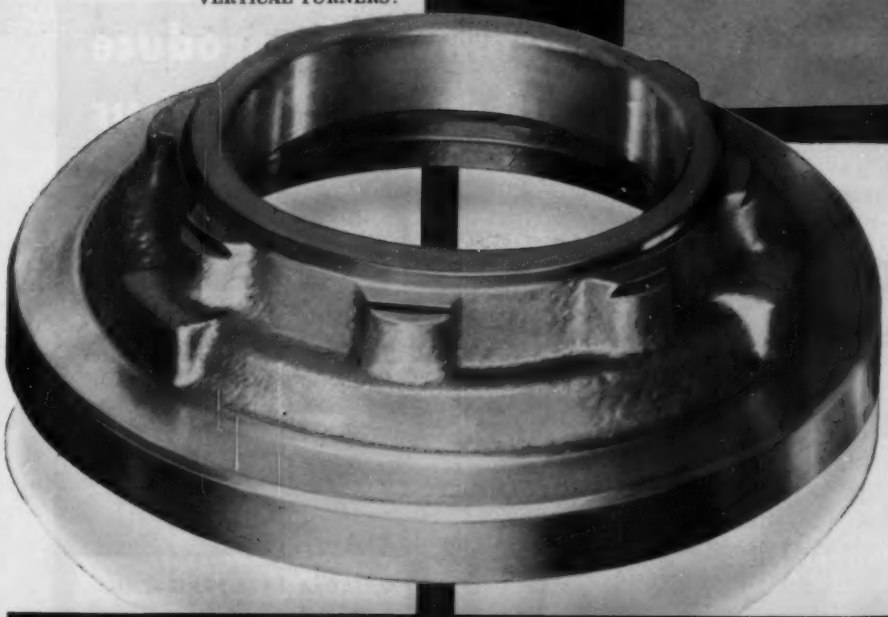
CIRCLE 943 READER SERVICE CARD

GREATER TURNING ACCURACY

HIGH SPEED PRODUCTION with tolerances held to .0002 in. is achieved at the Axle Division of EATON MANUFACTURING COMPANY, Cleveland, on finish turning the 7.388 in. pilot diameter and boring the 6.378 in. inside diameter of a 2-speed drive gear for truck axles. Other machines were tried but production was low and accuracy difficult to maintain. On the amazing new **MOTCH & MERRYWEATHER VERTICAL TURNER** cycle time was held to 45 seconds. Greater rigidity at the spindle, greater turning power, fully automatic control of the cutting tool is the answer. For production speed with accuracy you just can't beat the Motch & Merryweather VERTICAL TURNERS!



- RIGID CAST COLUMN HOLDS TOOL POSITION ACCURATELY
- ALL HYDRAULICS EXTERNALLY MOUNTED
- TOOL SLIDES MOUNTED ON HARDENED AND GROUND WAYS
- TOOL POSITIONS EASILY CHANGED
- TREMENDOUS TURNING POWER AT THE SPINDLE
- SPINDLE RUN-OUT HELD TO .0002"
- HAND-HIGH CONTROLS
- PUSH-BUTTON CHUCKING
- CHIPS STAY CLEAR FOR EASY REMOVAL
- SIMPLE, AUTOMATIC, SEQUENTIAL PROGRAMING
- BASES OF HEAVY INTERNALLY-RIBBED CAST IRON OCCUPY 50% LESS FLOOR AREA
- ALL COMPONENTS CAN BE ASSEMBLED AS DESIRED OR CHANGED AT WILL



MOTCH AND MERRYWEATHER

1250 East 222nd Street · CLEVELAND 17, OHIO

Check the facts! Learn how the Vertical Turner, custom-assembled from production-made components to effect huge savings in capital investment, also makes great savings through improved accuracy and higher production rates. Write today for catalog.

CIRCLE 944 READER SERVICE CARD

NEW FOR 1960

- New Improved Design
- Increased Durability
- 1" Shorter over-all height
- Full adjustment for wear

A Boring Head That Won't Face Is OBSOLETE

Boring, Facing, Grooving, Turning—All in One Toolhead "As it should be"

SIX SIZES AVAILABLE

Write today for full details

MODEL "D" 1960

CHANDLER TOOL CO.
Muncie, Indiana, U.S.A.

Chandler-Duplex
COMBINED BORING AND FACING TOOLHEADS

CIRCLE 945 READER SERVICE CARD

REMOVE COILS FROM PALLETS QUICKLY & EASILY

- Safe
- Labor-Saving
- Efficient
- Won't Damage Material!
- Self-Contained
- Automatic
- Portable

Sizes to handle loads from 3,000 to 40,000 pounds. Prices start at $2000.

Fork truck sets palletized coils on bed of cradle.

Cradle tips backward as base rotates.

Cradle nears end of 90° backward tip as it is finishing its 180° rotation.

Coils, now off pallet, face truck and are ready to fork.

turnover cradle
A Product of LA DEAU MANUFACTURING COMPANY
2702 San Fernando Road, Los Angeles 65, California
Telephone CApitol 2-8108

CIRCLE 946 READER SERVICE CRAD

A Grieder Tube Cut-Off Machine will produce 4500 to 6500 cut-offs per hour

Grieder Tube Cut-Off Machines are 3 to 8 times faster than others, and speed is only one of the cost saving advantages they provide. For example:

- $ Cut tubing of any shape to any length—steel, copper, brass, aluminum and alloys. Continuous automatic operation.
- $ Lengths can be held to plus or minus .002" on light wall tubing and to .003" on heavier.
- $ Precision clamping dies prevent tube distortion and produce a quality cut. Tube does not rotate.
- $ Thousands of cuts without grinding. Blades can be sharpened on standard tool room equipment and used for as many as a million cuts.

Write for literature, stating tube sizes and production requirements.

Grieder
TUBE CUT-OFF MACHINES

GRIEDER INDUSTRIES, INC.
P. O. Box 169 • Bowling Green, Ohio

Please send bulletin describing Grieder Tube Cut-Off Machines.

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COMPANY_____
CITY_____ ZONE____
STATE_____

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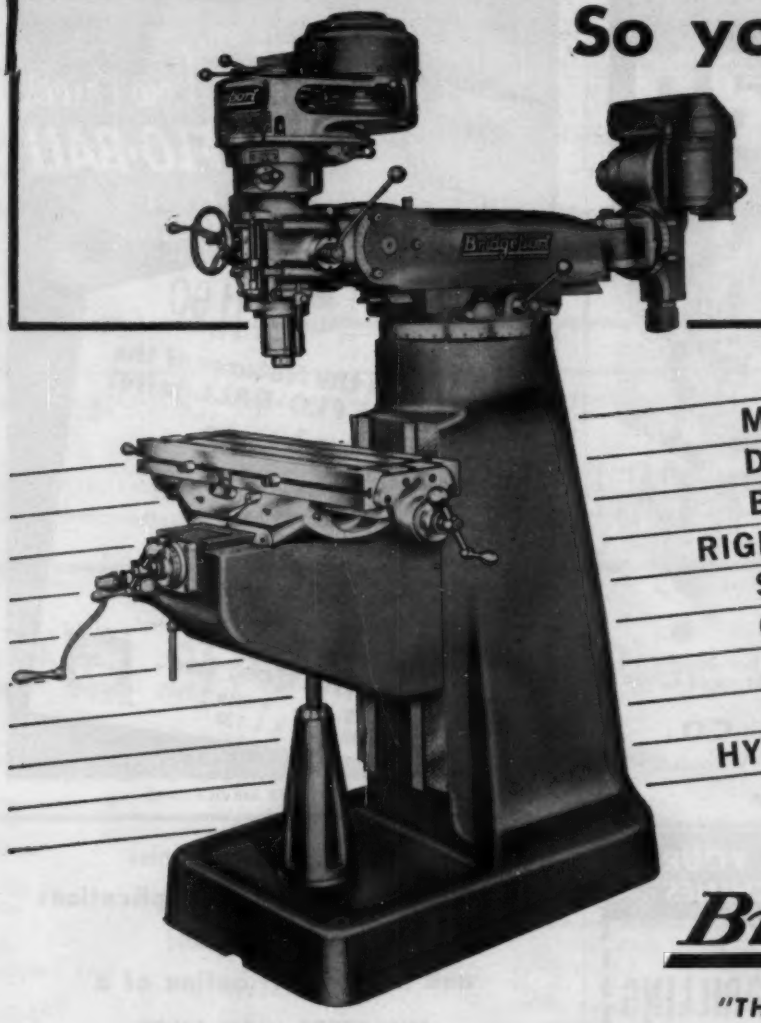
So you want VERSATILITY?

Here it is . . .



MILLING
DRILLING
BORING
RIGHT ANGLE MILLING
SLOTTING
CHERRYING
FLY CUTTING
PROFILING
HYDRAULIC DUPLICATING

with the

Bridgeport

"THE MOST FOR THE LEAST"

ATTACHMENTS and ACCESSORIES to increase versatility

Milling, Drilling and Boring Attachments: Model "J" 1 HP; Model "M" ½ HP; Model "R" ½ HP and Model "C" ¼ HP (Rigid Spindle)

Cherrying Attachment

Slotting Attachment

Power Feed

Measuring Attachment (Rods and Indicators)

Optical Measuring System

(A recent addition to the Bridgeport line)

Hydraulic Duplicators (1, 2 and 3 Dimension)

Synchro Trace (Fully Automatic, Single Dimension Duplicator)

Coolant Pump

Four-Inch Raising Block

Seven-Inch Raising Block

Cross Travel Stops

Lights

Right Angle Attachments Nos. 1, 2, 3

Quill Master Attachments

Quill Master Right Angle Attachment

Shell Mill Holders Nos. 1, 2, 3

Fly Cutters, FC-3, FC-4

Threaded Arbors

Stub Arbors

End Mill Holders

Spindle Adapters

Vises Nos. 1 and 2 (Swivel and Plain)

Profilers for Model "J" and "M" Heads

Boring Heads Nos. 1 and 2

Collets

Chucks (Jacobs and Albrecht)

Rotary Tables, 12" and 15"

Further details are available through your nearest dealer or from us direct.

Bridgeport MACHINES, INC.

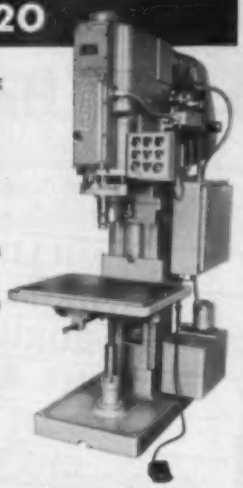
Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

FOR HIGH SPEED PRECISION TAPPING
CHOOSE THE

kaufman

MODEL 10E-20



Six features of this new, precision-built Kaufman Tapping Machine are:

1. Lead screw control for accurate threads and maximum tool life. Maximum 4½" lead screw travel.
2. Rapid approach of spindles to work.
3. Clutch operated for faster operation — Reversing spindles at twice forward speed.
4. Six speed transmission providing spindle speeds of 80-350 RPM with 3-1 ratio or 160-700 with 1½-1 ratio clutch.
5. Units provided with 5-7½-10 H.P. Motors.
6. Speeds and H.P. available for highly efficient tapping from ⅜" through 2" NC taps or smaller taps with use of multiple head.

KAUFMAN

For additional information about the new Model 10E-20 or other Kaufman machines for single or multiple operation, write or telephone:

KAUFMAN MFG. CO.

543 S. 29th Street Manitowoc, Wisconsin

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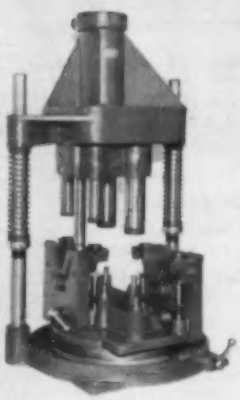
CIRCLE 950 READER SERVICE CARD

GET THE MOST FROM YOUR SINGLE PURPOSE MACHINES



with

HOEFER DRILLING HEADS & FIXTURES

MULTIPLE SPINDLE DRILLING AND TAPPING HEADS

ADJUSTABLE CENTER HEADS

HYDRAULIC FEED DRILLING UNITS

SPECIAL UNIT-TYPE MACHINERY

For multiple hole operations on short run, repetitive items, Hoefer engineers have the solution whereby you, too, can get the greatest productivity from your single purpose machinery. Quick change over, dependable operation, and readiness of installation, all add up to one important factor — Cost Reduction! Write today for catalog #60 and the name of our nearest representative.

FOUNDED 1892

HOEFER MANUFACTURING CO.

FREEPORT, ILLINOIS

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for the development of applications

in the industrial field

and in the distribution of a

MINIATURE HIGH SPEED AIR DRIVEN GRINDING TOOL

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Class. Adv. Div., P.O. Box 12, N. Y. 36, N. Y.

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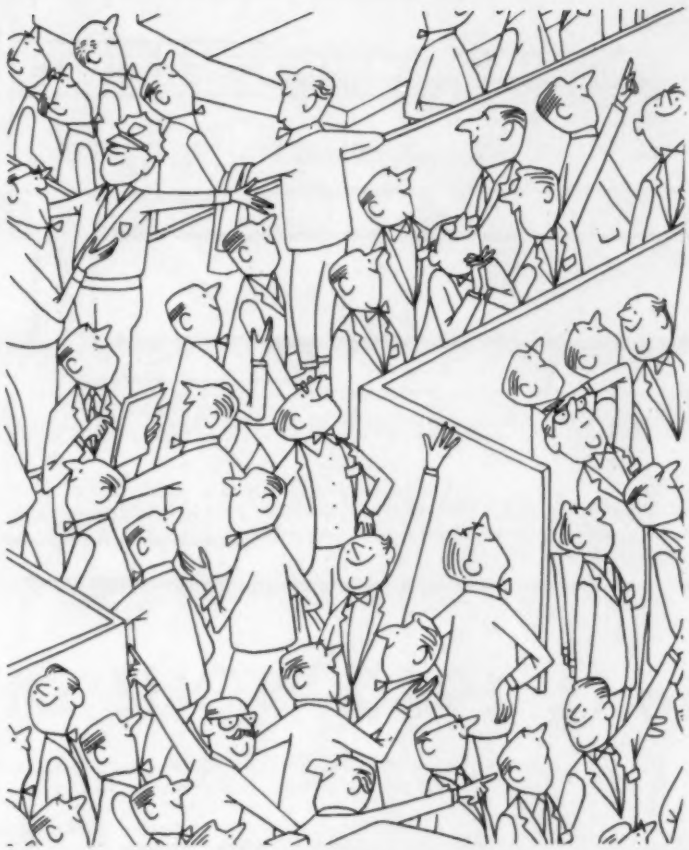
RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.

CIRCLE 952 READER SERVICE CARD

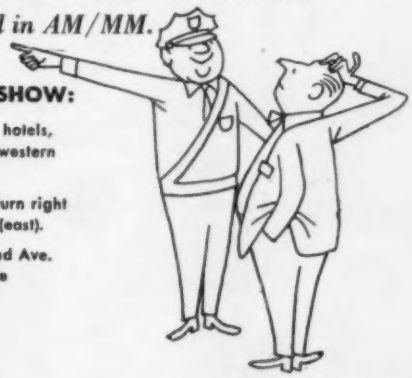


PRODUCTION ENGINEERING SHOW IN PRINT

Navy Pier, Chicago, Illinois

September 6 to 16, 1960, 1:00 pm to 10:00 pm (closed Sunday)

Cutting tools and cutting oils, control systems, gages and precision instruments, electrical equipment and metalworking accessories will be on display. New products introduced at the show are described in this section. All will be on display, along with many others previously described in AM/MM.



HOW TO GET TO THE PRODUCTION ENGINEERING SHOW:

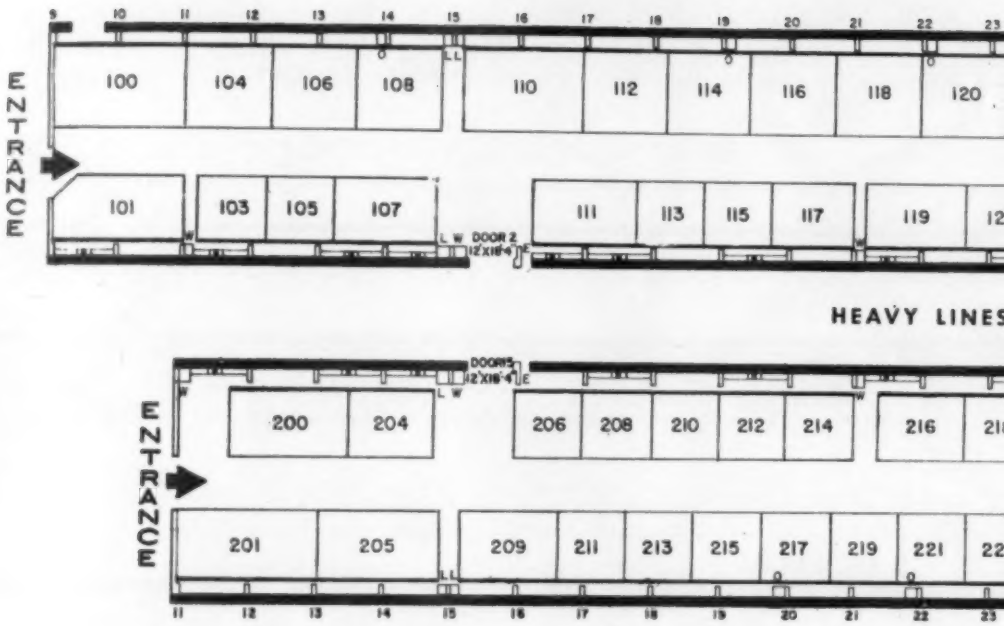
BUS: Special non-stop buses operate to the Navy Pier from the principal Loop hotels, and from the Machine Tool Exposition. Bus No. 15 goes from Union and Northwestern railroad stations to the Navy Pier.

PRIVATE CAR: Take Lake Shore Drive or Michigan Ave north to Ohio St and turn right (east), or take any northbound Loop street north to Grand Ave and turn right (east).

SUBWAY: Take any northbound State Street Subway train "A" or "B" to Grand Ave. Transfer to eastbound bus No. 65. Get transfer at time fare is paid and validate (time stamp) after leaving train but before leaving subway station.

American Machinist / *Metalworking Manufacturing*

PULL OUT FOR FLOOR PLAN AND LIST OF EXHIBITORS →



List of Exhibitors

481 A & A Mfg Co, Inc
Milwaukee 4, Wisc

361 Acco Equipment Div
American Chain & Cable Co
York, Penn

610 ACF Electronics Div
ACF Industries, Inc
Paramus, N J

153 Adamas Carbide Corp
Kenilworth, N J

535 Amp, Inc
Harrisburg, Pa

306 Acro Div
Robertshaw-Fulton Controls Co
Columbus 16, Ohio

300 Advance Products Corp
Benton Harbor, Mich

483 Airmatic Valve, Inc
Cleveland 9, Ohio

251 Alemite Div
Stewart-Warner Corp
Chicago 14, Ill

216 Allen-Bradley Co
Milwaukee, Wisc

127 The Louis Allis Co
Milwaukee 1, Wisc

470 Aloris Tool Co
Clifton, N J

604 American Electronics, Inc
Industrial Machinery Div
Norwood, Mass

131 American Machinist/Metal-working Manufacturing
New York 36, N Y

462 American Metal Forming Co, Inc
Cleveland 11, Ohio

526 American Screw Co
Willimantic, Conn

480 American Sealants Co
Hartford 6, Conn

460 The Arcair Co
Lancaster, Ohio

238 Armstrong Bros Tool Co
Chicago 46, Ill

267 The Arrow-Hart & Hegeman Electric Co
Hartford 6, Conn

516 Associated American Winding Machine Inc
New York 56, New York

204 Associated Spring Corp
Bristol, Conn

326 Atkins Saw Div
Borg-Warner Corp
Indianapolis 25, Ind

132 Automatic Switch Co
Florham Park, N J

304 Balcrank Inc
Machine Tool Div
Cincinnati 9, Ohio

387 Barry Controls Inc
Watertown 72, Mass

141 Beaver Pipe Tools Inc
Warren, Ohio

530 The Bendix Corp
Industrial Controls Section
Detroit 37, Mich

330 G S Blakeslee & Co
Cicero 50, Ill

528 Boeing Airplane Co
Wichita, Kansas

123 Boston Gear Works
Quincy 71, Mass

423 Brauer Electric Mfg Co
Chicago 40, Ill

407 The Bristol Co
Waterbury 20, Conn

601 Brook Motor Corp
Chicago 45, Ill

252 Browning Mfg Co
Maysville, Ky

507 Buchanan Electrical Products Corp
Hillside, N J

244 Buck Tool Co
Kalamazoo, Mich

210 C I T Corp
New York 21, N Y

427 Camloc Div
Empire Products, Inc
Cincinnati 36, Ohio

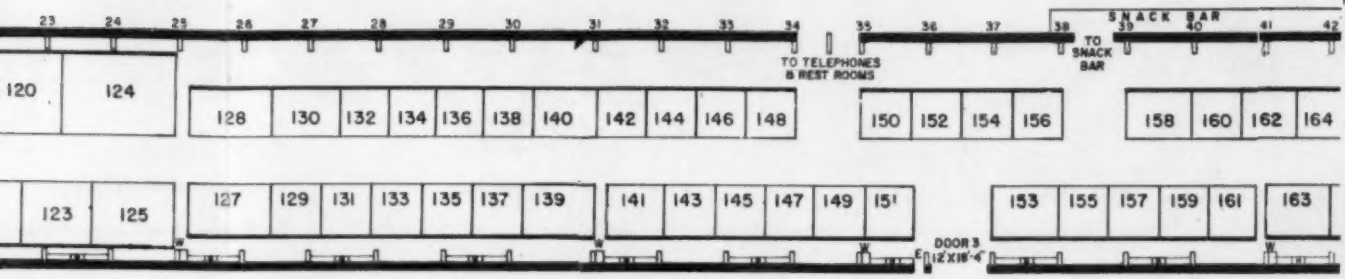
457 Casting Engineers Div
Consolidated Foundries & Mfg Corp
Chicago 14, Ill

429 Chicago Powdered Metal Products Co
Schiller Park, Ill

331 Chicago Reference Book Co
Chicago 20, Ill

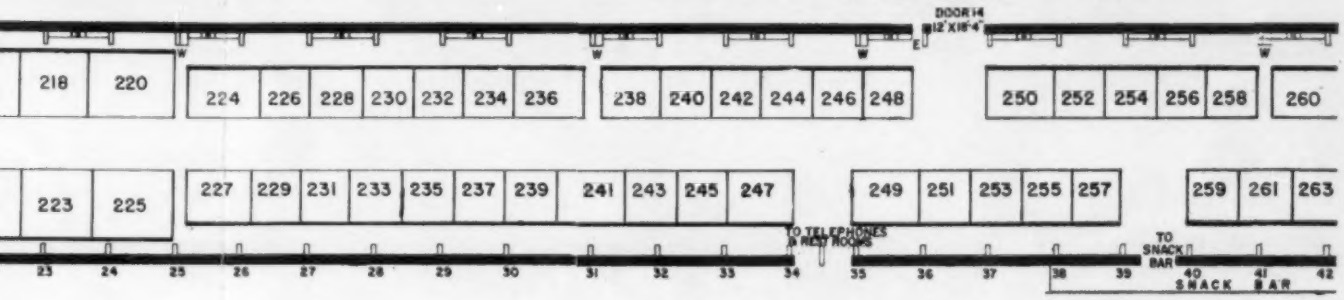
236 Chicago Rivet & Machine Co
Bellwood, Ill

NORTH HALL–NAVY PIER



INES INDICATE BOOTH BACKGROUND

SOUTH HALL–NAVY PIER



523 Chicago Tool & Engineering Co
Chicago 17, Ill

383 Chicago Wheel & Mfg Co
Chicago 7, Ill

137 Clark Controller Co
Cleveland 10, Ohio

227 Clark, Cutler and McDermott
Franklin, Mass

515 Cogsdill Tool Products, Inc
Oak Park 37, Mich

424 Collins Microflat Co
Hawthorne, Calif

321 Commander Mfg Co
Chicago 24, Ill

622 Consolidated Kinetics Corp
Columbus 8, Ohio

258 Copy-Craft, Inc
New York 7, N Y

478 Counter and Control Corp
Milwaukee 18, Wisc

454 Arthur A Crafts Co, Inc
Boston 15, Mass

456 Cramer Controls Corp
Centerbrook, Conn

472 Walter Cronan Co
New York 5, N Y

443 Crown Tool, Inc
Wabash, Ind

307 Crucible Steel Co of America
Pittsburgh 30, Pa

529 The Cuno Engineering Corp
Meriden, Conn

378 Curtiss-Wright Corp
Marquette Div
Cleveland 10, Ohio

128 The Cushman Chuck Co
Hartford 2, Conn

142 Cutler-Hammer, Inc.
Milwaukee 1, Wisc

211 Dake Corp
Grand Haven, Mich

256 Dazor Mfg Corp
St Louis 10, Mo

223 Delco Products Div
General Motors Corp
Dayton 1, Ohio

441 Deluxe Coils, Inc
Wabash, Ind

406 R B Denison Mfg Co
Bedford, Ohio

477 De Van-Johnson Co
Aurora, Ill

230 Devcon Corp
Danvers, Mass

336 The DeVilbiss Co
Toledo 1, Ohio

607 DeVry Technical Institute
Chicago 41, Ill

264 Die-Draulic Grip, Inc
Grand Rapids 4, Mich

136 Diehl Mfg Co
Somerville, N J

116 The DoALL Co
Des Plaines, Ill

302 Durant Mfg Co
Milwaukee 1, Wisc

234 The Eldridge Co
Philadelphia 3, Pa

381 Eagle Signal Co
Moline, Ill

614 Eclipse Machine Div
The Bendix Corp
Elmira, N J

606 Electro Dynamic Div
General Dynamics Corp
Bayonne, N J

379 Empire Corp
Milwaukee 14, Wisc

468 Enco Mfg Co
Chicago 39, Ill

335 Encyclopaedia Britannica
Chicago 1, Ill

363 Engineered Electronics Co
Santa Ana, Calif

467 Engis Equipment Co
Chicago 5, Ill

608 Equitable Leasing Corp
New York 5, New York

247 Ettco Tool & Machine Co, Inc
Brooklyn 37, N Y

525 FAC Div, Overseas Commodex Inc
Detroit 4, Mich

217 The Fafnir Bearing Co
New Britain, Conn

350 Fairbanks, Morse & Co
Chicago, Ill

103 Farrand Controls, Inc
New York 70, N Y

209 Farrington Mfg Co
Needham 94, Mass

224 Fawick Airflex Co, Inc
Cleveland 11, Ohio

310 The Federal Bearings Co, Inc
Poughkeepsie, N Y

445 Federal Pacific Electric Co
Newark 1, N J

359 The Felters Co
Boston, Mass

437 Fenway Machine Co, Inc
Philadelphia 32, Pa

246 Ferguson Machine Corp
St Louis 17, Mo

500 Field Abrasive Mfg Co
Dayton, Ohio

208 Florida Development Commission
Tallahassee, Fla

325 Formsprag Co
Van Dyke, Mich

334 Friden, Inc
San Leandro, Calif

511 Furnas Electric Co
Batavia, Ill

346 Gaertner Scientific Corp
Chicago 14, Ill

512 Bast Mfg Corp
Benton Harbor, Mich

521 General Automation Corp
Flushing 54, N Y

110 General Electric Co
Schenectady 5, N Y

630 General Radio Co
West Concord, Mass

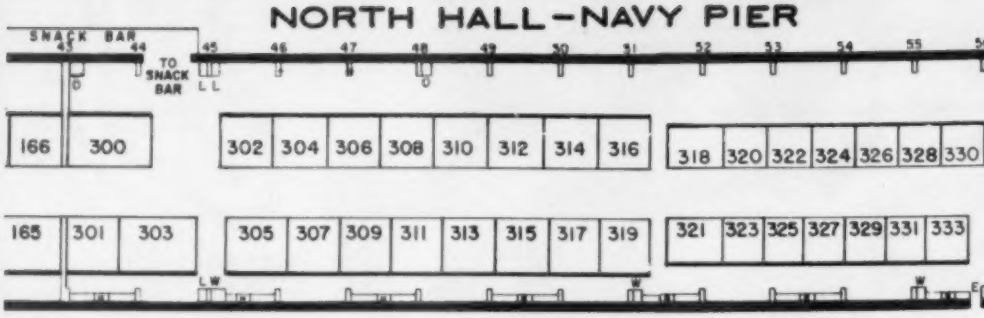
205 Gilman Engineering & Mfg Co
Janesville, Wisc

339 Graflex Corp
Rochester 3, N Y

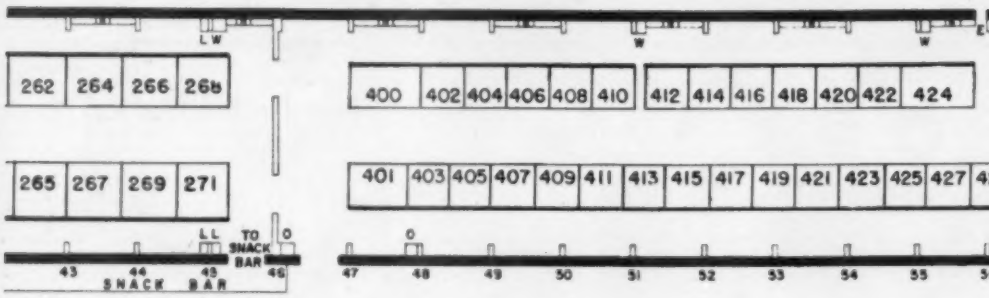
303 Graham Transmissions, Inc
Menomonee Falls, Wisc

PRODUCTION ENGINEERING SHOW

NORTH HALL—NAVY PIER



SOUTH HALL—NAVY PIER



PRODUCTION ENGI

320 Green Instrument Co, Inc
Cambridge 39, Mass

154 Hamilton Mfg Co
Two Rivers, Wisc

432 Hammond Machinery Builders Inc
Kalamazoo, Mich

318 F Ward Harman Associates
Long Island, N Y

348 Haydon Div
General Time Corp
Torrington, Conn

368 Hevi-Duty Electric Co
Milwaukee, Wisc

349 Hitchiner Mfg Co, Inc
Milford, N H

408 Hoffmann Engineering Corp
Anoka, Minn

165 The Holo-Krome Screw Corp
Hartford 10, Conn

433 Hyat Bearings Div
General Motors Corp
Harrison, N J

450 The Imperial Brass Mfg Co
Chicago 48, Ill

140 Imperial Stamp & Engraving Co
Skokie, Ill

520 Industrial Coils, Inc
Baraboo, Wisc

458 Industrial East Co
Clifton, N J

624 Inspection Control Corp
Lake City, Mich

428 International Business Machines Corp
New York 22, N Y

113 The Jacobs Mfg Co
West Hartford 10, Conn

324 Janette Electric Mfg. Co
Morton Grove, Ill

203 Jerico, Inc
Chicago 44, Ill

493 Jiffy Disintegrators, Inc
Royal Oak, Mich

626 Kellems Co, Inc
Stonington, Conn

111 Kennametal, Inc
Latrobe, Pa

506 The Korfund Co
Long Island City, N Y

147 La Salle Steel Co
Chicago 80, Ill

611 Lear, Inc
Grand Rapids 2, Mich

362 Lempco Industrial, Inc
Bedford, Ohio

215 The Lima Electric Motor Co
Lima, Ohio

225 Lindberg Engineering Co
Chicago, Ill

333 Lowell Industries, Inc
Boston 34, Mass

475 Lubriquipment Engineers Inc
Ft Worth 7, Texas

426 The Lufkin Rule Co
Saginaw, Mich

605 Luxo Lamp Corp
Port Chester, N Y

504 MB Electronics Div
Textron Electronics Inc
New Haven 8, Conn

459 Machinery Electrification, Inc.
Northboro, Mass

541 MacRae's Blue Book
Chicago 11, Ill

400 Magnaflux Corp
Chicago 31, Ill

476 Manheim Mfg & Belting Co
Manheim, Pa

249 Marathon Electric Mfg Corp
Wausau, Wisc

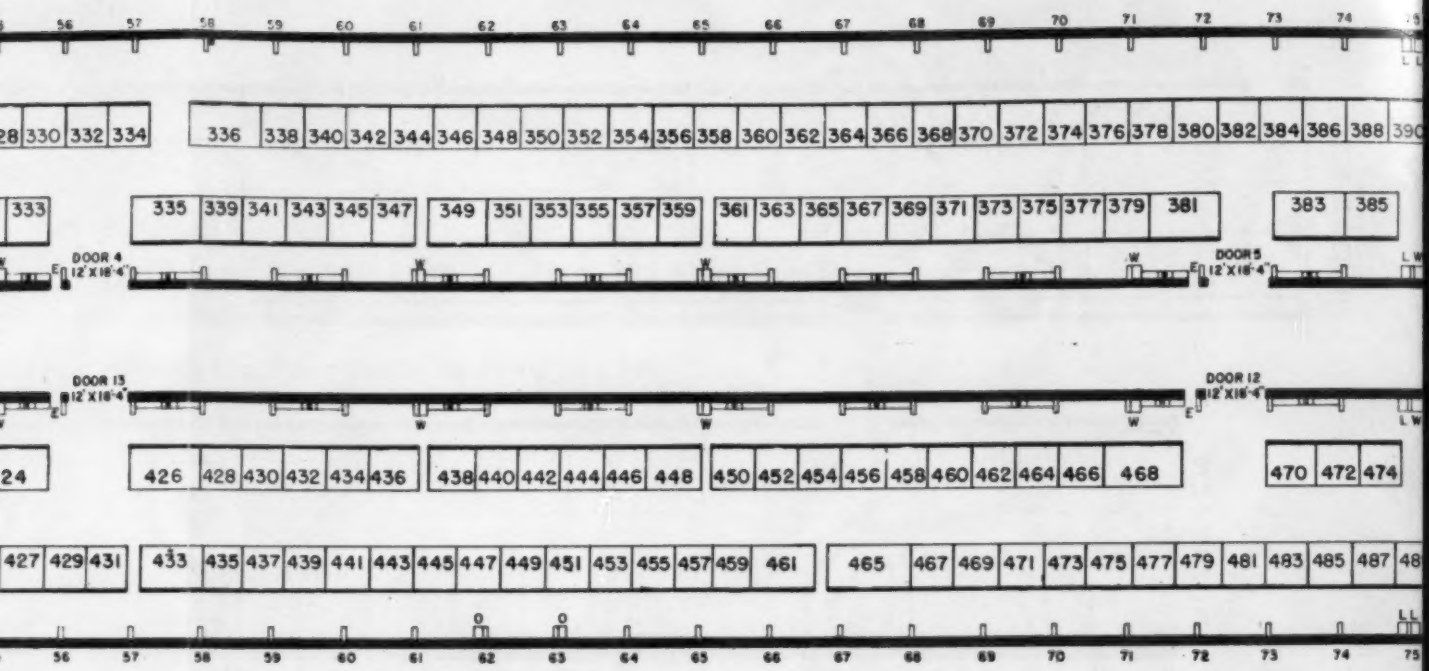
125 Marlin-Rockwell Corp
Jamestown, N Y

371 Martin Engineering Co
Neponset, Ill

253 Marvel Engineering Co
Chicago 45, Ill

455 May-Fran Engineering, Inc
Cleveland 12, Ohio

213 McGill Mfg Co
Valparaiso, Ind



GINEERING SHOW Navy Pier, Chicago, Illinois

600 The Metal Removal Co
Chicago 26, Ill

145 Micro-Poise Engineering & Sales Co
Detroit 27, Mich

418 Micrometrical Mfg Co
Ann Arbor, Mich

271 Micro Switch Div
Minneapolis-Honeywell Regulator Co
Freeport, Ill

106 Miller Fluid Power Co
Div of Flick-Reedy Corp
Bensenville, Ill

308 Mo-Bar Hydraulic Sales Co
Crystal Lake, Ill

328 Modern Mfg Co, Inc
Willow Grove, Pa

206 Moog Servocontrols, Inc
East Aurora, N Y

402 Morrison Machinery and Engineering Co
Chicago 7, Ill

299 National Diamond Laboratoy, Inc
Peekskill, N Y

479 National Equipment Rental Ltd
Floral Park, N Y

133 New Departure Div
General Motors Corp
Bristol, Conn

431 New Hermes Engraving Machine Corp
New York 11, N Y

257 New Method Steel Stamps, Inc
Detroit 7, Mich

487 L Newman Tool, Die & Machine Works
Oakland 7, Calif

503 Nichols-Morris Corp
White Plains, N Y

221 Norden Div
United Aircraft Corp
Gardena, Calif

385 North Electric Co
Galion, Ohio

416 Northwestern Tools, Inc
Dayton 3, Ohio

474 The Nylok Corp
Skokie, Ill

259 O'Neil-Irwin Mfg Co
Lake City, Minn

501 Onsrud Cutter Mfg Co
Libertyville, Ill

412 Opto-Metric Tools, Inc
New York 13, N Y

375 The Osborn Mfg Co
Cleveland 14, Ohio

435 Owatonna Tool Co
Owatonna, Minn

491 Ozalid Div.
General Aniline & Film Corp
Johnson City, N Y

602 Paramount Textile Machinery Co
Chicago 3, Ill

489 Parker-Kalon Div
General American Transportation Corp
Clifton, N J

205 The Parker Pen Co
Janesville, Wisc

472 Perrysburg Tool Service Inc
Perrysburg, Ohio

343 Penco Associates
Des Plaines, Ill

158 Penton Publishing Co
Cleveland 13, Ohio

438 Phillips Mfg Co
Chicago 45, Ill

266 Pines Engineering Co, Inc
Aurora, Ill

201 Pivot Punch & Die Corp
North Tonawanda, N Y

369 Plan Hold Corp
South Gate, Calif

358 Portage Double Quick, Inc
Akron 11, Ohio

625 Precise Products Corp
Racine, Wisc

514 Productive Equipment Corp
Chicago 12, Ill

410 Production Machine Co
Greenfield, Mass 233

405 PurOlator Products, Inc
Rahway, N J 229

143 Redin Production Machine Co
Rockford, Ill 240

411 Reliance Electric & Engineering Co
Cleveland 17, Ohio 404

305 J A Richards Co
Kalamazoo, Mich 212

117 Roller Bearing Co of America
West Trenton, N J 239

220 Ross Operating Valve Co
Detroit, Mich 373

166 Rowe Machinery & Manufacturing Co
Dallas 35, Texas 419

508 RoyEl Tools
Minneapolis 22, Minn 269

376 The Ruthman Machinery Co
Cincinnati 2, Ohio 262

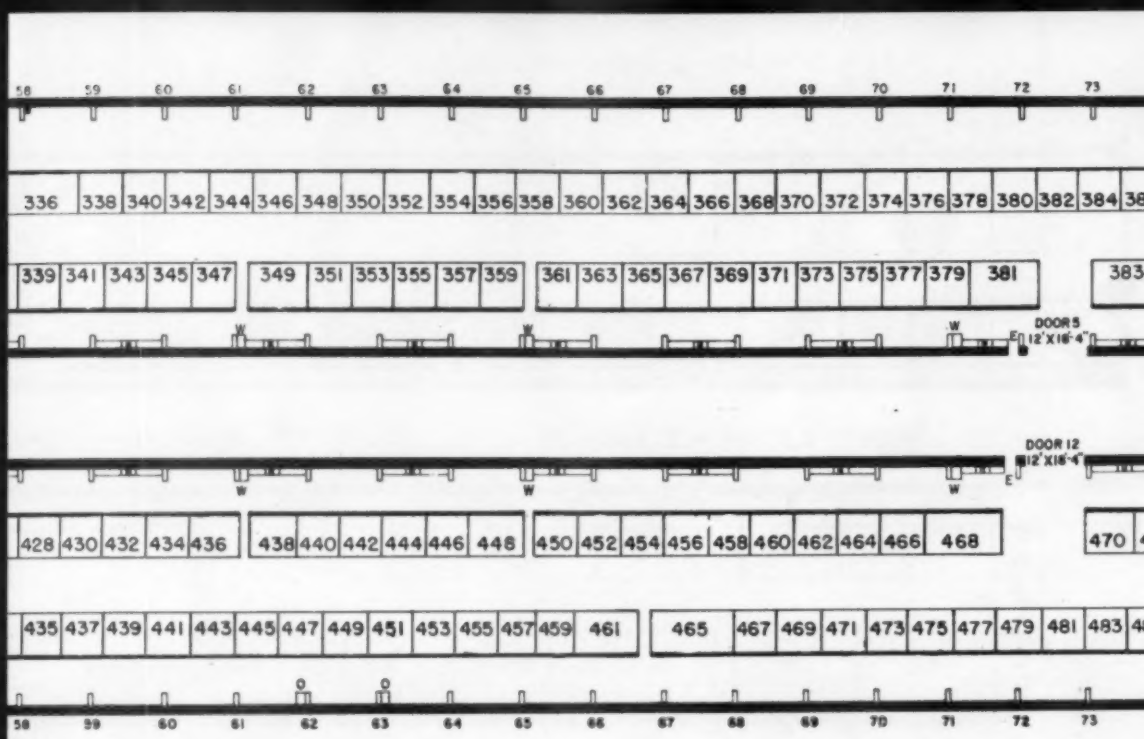
403 Safety Socket Screw Co
Chicago 31, Ill 100

104 Saginaw Steering Gear Div
General Motors Corp
Saginaw, Mich 345

505 Sargent and Co
Hand Tool Div
New Haven, Conn 471

322 Schauer Mfg Corp
Cincinnati 42, Ohio 232

356 Scherr-Tumico Chicago Co
Chicago, Ill 150



RING SHOW Navy Pier, Chicago, Illi

Removal Co
6, Ill

Engineering &
Mich

cal Mfg Co
, Mich

ch Div
s-Honeywell Regu-
Ill

d Power Co
k-Reedy Corp
, Ill

draulic Sales Co
ke, Ill

fg Co, Inc
ove, Pa

vocontrols, Inc
ra, N Y

Machinery and En-
g Co
, Ill

Diamond Laboratoy,

N Y

Equipment Rental

k, N Y

rture Div
Motors Corp
nn

431 New Hermes Engraving Machine Corp
New York 11, N Y

257 New Method Steel Stamps, Inc
Detroit 7, Mich

487 L Newman Tool, Die & Machine Works
Oakland 7, Calif

503 Nichols-Morris Corp
White Plains, N Y

221 Norden Div
United Aircraft Corp
Gardena, Calif

385 North Electric Co
Galion, Ohio

416 Northwestern Tools, Inc
Dayton 3, Ohio

474 The Nylok Corp
Skokie, Ill

259 O'Neil-Irwin Mfg Co
Lake City, Minn

501 Onsrud Cutter Mfg Co
Libertyville, Ill

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375 The Osborn Mfg Co
Cleveland 14, Ohio

435 Owatonna Tool Co
Owatonna, Minn

491 Ozalid Div.
General Aniline & Film Corp
Johnson City, N Y

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General American Transportation Corp
Clifton, N J

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Des Plaines, Ill

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Cleveland 13, Ohio

438 Phillips Mfg Co
Chicago 45, Ill

266 Pines Engineering Co, Inc
Aurora, Ill

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North Tonawanda, N Y

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South Gate, Calif

358 Portage Double Quick, Inc
Akron 11, Ohio

625 Precise Products Corp
Racine, Wisc

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Chicago 12, Ill

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Greenfield, Mass

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Rahway, N J

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Rockford, Ill

411 Reliance Electric & Engineering Co
Cleveland 17, Ohio

305 J A Richards Co
Kalamazoo, Mich

117 Roller Bearing Co of America
West Trenton, N J

220 Ross Operating Valve Co
Detroit, Mich

166 Rowe Machinery & Manufacturing Co
Dallas 35, Texas

508 RoyEl Tools
Minneapolis 22, Minn

376 The Ruthman Machinery Co
Cincinnati 2, Ohio

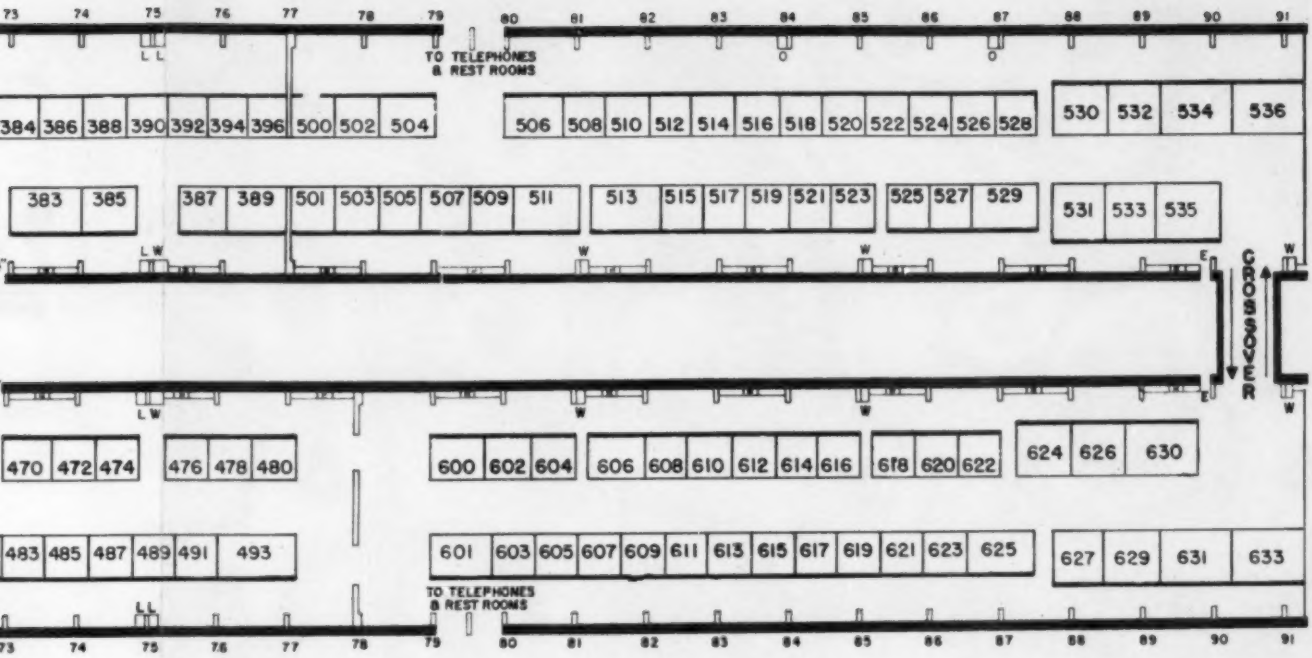
403 Safety Socket Screw Co
Chicago 31, Ill

104 Saginaw Steering Gear Div
General Motors Corp
Saginaw, Mich

505 Sargent and Co
Hand Tool Div
New Haven, Conn

322 Schauer Mfg Corp
Cincinnati 42, Ohio

356 Scherr-Tumico Chicago Co
Chicago, Ill



llinois, September 6 to 16, 1960

233 Geo T Schmidt, Inc
Chicago 13, Ill

229 Scully-Jones & Co
Chicago 8, Ill

240 Sheldon Machine Co, Inc
Chicago 41, Ill

404 Sigamotor, Inc
Middleport, N Y

212 The Skinner Chuck Co
& Skinner Electric Valve Div
New Britain, Conn

239 A O Smith Corp
Milwaukee 1, Wisc

373 Sola Electric Co
Div of Basic Products Corp
Chicago 50, Ill

419 Specialties, Inc
Syosset, N Y

269 Space Components, Inc
Washington 7, D C

262 Spiral Step Tool Co
Chicago 25, Ill

100 Square D Co
Milwaukee 12, Wisc

345 Stahlin Bros, Inc
Belding, Mich

471 Standard Oil Co of Indiana
Chicago 5, Ill

232 Standard Pressed Steel Co
Jenkintown, Pa

150 The L S Starrett Co
Athol, Mass

465 Stewart-Warner Corp
Industrial Balancer Dept
Chicago 14, Ill

609 Sumitmo Shoji Kaisha Ltd.
Chicago 4, Ill

327 Sunnen Service Corp
St Louis 17, Mo

226 Supreme Products Corp
Chicago 26, Ill

163 Synthane Corp
Oaks, Pa

329 The Tap Cartridge Co
Cincinnati 1, Ohio

157 Tapmatic Corp
Costa Mesa, Calif

510 Tecnica Corp
Long Island City 1, N Y.

160 G H Tennant Co
Minneapolis 22, Minn

374 Texas Instrument Inc
Semiconductor-Components
Div
Dallas, Texas

314 The Timken Roller Bearing
Co
Canton 6, Ohio

219 Toledo Scale Div
Toledo Scale Corp
Toledo 12, Ohio

401 Torit Mfg Co
St Paul 2, Minn

155 Trabon Engineering Corp
Solon, Ohio

442 Troyke Mfg Co
Cincinnati 41, Sharonville,
Ohio

106 Tru-Seal Div
Flick-Reedy Corp
Bensenville, Ill

449 Tubular Rivet & Stud Co
Woolaston 70, Mass

365 Union Mfg Co
New Britain, Conn

241 The U S Burke Machine Tool
Div
Cincinnati Mfg Corp
Cincinnati 27, Ohio

159 U S Electrical Motors, Inc
Los Angeles 54, Calif

312 United States Leasing Corp
San Francisco 4, Calif

119 United States Rubber Co
Mechanical Goods Div
New York 20, N Y

627 Valenite Metals
Div of Valeron Corp
Royal Oak, Mich

124 Vascaloy-Ramet Corp
Waukegan, Ill

107 Vickers, Inc
Detroit 32, Mich

347 The E H Wachs Co
Chicago 22, Ill

260 Wagner Electric Corp
St Louis 33, Mo

340 Wales Strippit, Inc
Akron, N Y

509 Wang Laboratories, Inc
Natick, Mass

444 Warner Electric Brake &
Clutch Co
Beloit, Wisc

355 Watts Regulator Co
Lawrence, Mass

624 Wedin Corp
Cadillac, Mich

237 Welduction Corp
Detroit, Mich

464 Weltronic Co
Southfield, Mich

380 Wesco Tool, Inc
Burbank, Calif

301 Westinghouse Air Brake Co
Industrial Products Div
Wilmerding, Pa

101 Westinghouse Electric Corp
Pittsburgh 30, Pa

361 Wilson Mechanical Instrument
Div
American Chain & Cable Co,
Inc
Bridgeport 2, Conn

421 Wilton Tool Mfg Co, Inc
Schiller Park, Ill

527 Zenith Electric Co
152 W Walton St
Chicago 10, Ill

250 The Zero-Max Co
Minneapolis 5, Minn

Production Engineering Show in Print

GE 'Mark Century' Control Cuts Costs Of Contouring Operations

A new numerical control system for metalworking machines—the "Mark Century"—will make punched tape programming as simple and economical for contouring operations as for standard positioning. An addition to the "Mark" series of packaged controls, it represents engineering achievement in punched-paper-tape control of machine tools since the series went on the market in 1957, according to GE.

General Electric engineers expect the new control system to reduce the cost of automatic contouring control to levels considerably below those at present. The reason for this results from the fact that most continuous path machining consists of simple slopes or arcs of circles. The new control has the built-in capability to order these slopes and arcs without need for detailed, point-to-point programming instructions.

Given the length and direction of slope or radius and length of arc, the Mark Century can translate them directly in terms of machine motions. Therefore, major savings of computer time in continuous path programming will be made possible by the Mark Century's ability to relieve the computer of most of the simpler—but most time-consuming—calculations.

The need for a computer is completely eliminated on jobs involving only straight cuts, slopes, and arcs of circles. Control manuscript may be prepared directly from engineering drawings ready for a typist to punch the finished program.

General Electric Co, Schenectady 5, N Y—Booth 110

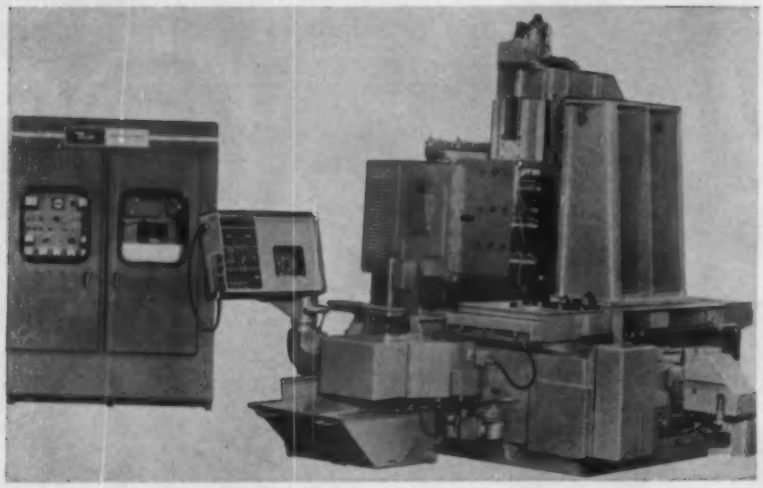
MORE DATA? Circle 366, inside back cover

Friden Machine Reads One Tape, Converts It to Another Code

The Friden Tape-to-Tape Code Converter automatically, and at high speed, reads one code (5-, 6-, 7-, or 8-channel tape) and simultaneously converts to any other of these four codes. It handles the unique characteristics of each code and at the same time assures conversion accuracy with automatic checking features.

Friden, Inc, San Leandro, Cal—Booth 334

MORE DATA? Circle 367, inside back cover



Bendix Three-Axis Numerical Control Has Transistorized Construction

The DynaPath-20, a new series of numerical control systems, features completely transistorized construction, automatic interpolation of circular cutter paths, and binary-coded decimal input tape format.

DynaPath-20 will be demonstrated on a 3-spindle Pratt & Whitney Numeric-Keller. This system, which has an electronic resolution of 0.0002 in., is capable of machining parts to a tolerance of less than one-thousandth in. The three-axis control unit occupies less than 10 sq ft of floor space and draws only 500 watts.

Tape preparation is relatively simple, because of the circular interpolation feature. The standard 8-channel punch tape uses the binary-coded decimal format, which may be prepared without the use of a computer for parts machined from straight line and circular paths.

The Bendix Corp, Industrial Controls Section, 21820 Wyoming Ave, Detroit 37, Mich—Booth 530

MORE DATA? Circle 368, inside back cover

Gaertner Has Completely New Small Toolmakers' Microscope

A new, small toolmakers' microscope, being unveiled at the show, has a coordinate measuring range of 2 x 2 in. Large diameter drums attached to the precision lead screws will permit convenient rapid reading to 0.0001 in. The base and stages are designed to support reasonably heavy piece parts without introducing significant errors of measurement.

The all new microscope incorporates an erecting system which makes all movements and images of the piece parts appear as they do to the unaided eye, thereby eliminating the confusion introduced by non-erecting systems where all movement and images appear exactly opposite to actual conditions. This microscope has interchangeable reticles and will accept the standard protractor ocular and templet ocular heads of the larger Gaertner microscope.

Among the standard surface illuminators that can be used is a new efficient circular type unit that permits making precision measurements in very small ID and deep holes.

Gaertner Scientific Corp, 1201 W Wrightwood Ave, Chicago 14, Ill—Booth 346

MORE DATA? Circle 369, inside back cover

Norden Display System Shows Actual Position of Tool, Work

The Series 100 linear display system provides readout of the actual cutting tool or workpiece position. Using the Norden analog-to-digital shaft encoder, the system is absolute rather than incremental and therefore prevents loss of information during power interruptions. Problems associated with gaining or losing counts are completely eliminated.

The system features full range electronic origin selection and built-in self checking circuitry. It has been specially designed for all types of machine tools used on small lot production, and can be successfully adapted to existing machine tools on a retrofit basis.

Norden Div of United Aircraft Corp, 13210 Crenshaw Blvd, Gardena, Cal— Booth 221

MORE DATA? Circle 370, inside back cover

Air-Operated Pines Model 660 Deburrs and Faces Stock Ends

End-finishing machine is air-powered through fast deburring, facing, and chamfering cycles to leave operator's hands free for loading and unloading parts. Speed is up to 1500 ends/hr.

Pines Engineering Co, Aurora, Ill—Booth 266

MORE DATA? Circle 371, inside back cover

Automatic Tool Changer Fits Tape-Run Single Spindles

An automatic tool changing system—a joint development by engineers at Scully-Jones and their subsidiary Scully-Anthony Corp—can easily be engineered into various tape controlled single spindle machine tools to speed up tool changes for se-

quence machining operations and help assure low cost small lot production.

The system changes tools in approximately 3 sec and incorporates a key in the tool encoder making possible the proper selection of any one of over 65,000 possible tool combinations for automatic tool change. Components are a pneumtaic or hydraulic actuated spindle chuck, basic tool holders, transfer arm, tool storage matrix, tool encoder, and logic circuit.

The spindle chuck and basic tool holders can also be operated manually, independent of the automatic tool changer, for quick-changing of preset tooling. In operations where work can be palletized, the tool holders can be used as work holders and turned while cutting tool is stationary.

Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, *Ill*—Booth 229, 231

MORE DATA? Circle 372, inside back cover

Onsrud Throwaway Mill Cutter Cuts Non-Ferrous Metals

High-speed cutting on non-ferrous metals is possible with a throwaway carbide-blade face milling cutter. The body has no separate wedges or cams to clamp the carbide inserts. Concentricity is maintained by locating on a cylindrical ring.

Onsrud Cutter Mfg Co, 800 E Broadway, Libertyville, Ill—Booth 501

MORE DATA? Circle 373, inside back cover

Ferguson Automatic Assembly Unit Embodies Machine Tool Concept

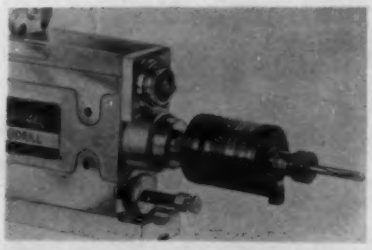
Ferguson's new automatic assembly machine embodies the machine tool concept whereby only special chucks, collets, or other holding devices designed to accommodate specific parts are added as one would apply special cutting tools and workholding fixtures to a production mill or screw machine.

Base of the machine is an Intermittor rotary transfer machine with parts-positioning motions provided to the indexing dial. "Pick-and-place" and "push-and-guide" actuations of integral stations result from two cams operating in a center-mounted turret. A grooved face cam provides horizontal parts-transfer at each station; a cylindrical cam actuates the vertical positioning motion.

The machine has six interchangeable stations, each of which serves to positions on the dial to double production over the machine's cyclic rate.

Ferguson Machine Corp, 7818 Maplewood Industrial Ct, St Louis, Mo—Booth 246-248

MORE DATA? Circle 374, inside back cover



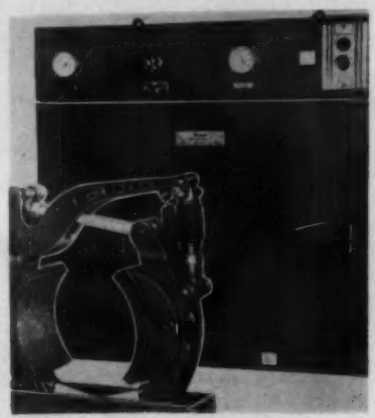
Precise Introduces Two New Tapping Heads for Autodrill

Two new, compact tapping heads are now available for the Precise Autodrill. Able to handle up to No. 10 and 5/16 in. taps, the new heads are interchangeable with the drill chuck while the Autodrill is in position.

The Autodrill is a fully automatic drill and tapping unit which mounts vertically or horizontally on two-inch centers. Spindle speeds ranging up to 6000 rpm assure accurate drilling with a capacity up to 5/16 in. and a maximum stroke of 1½ in.

Precise Products Corp, Racine, Wis—Booth 625

MORE DATA? Circle 375, inside back cover

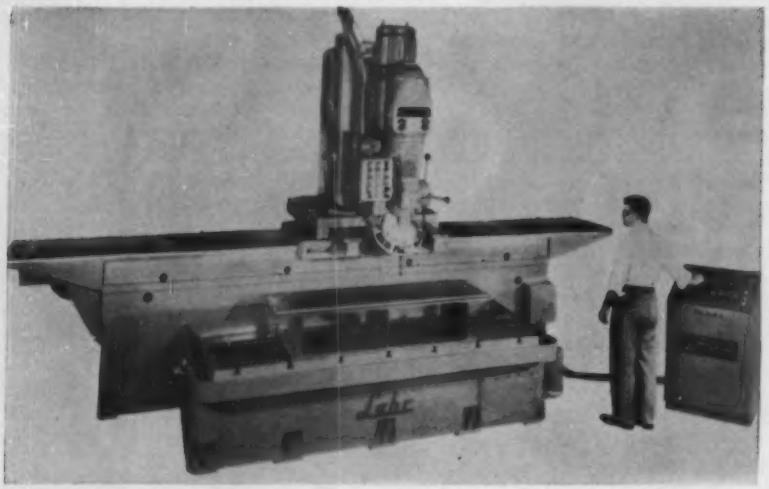


AIR-OVER-HYDRAULIC control system, designed primarily for use on inrunning rolls as a safety device, can also be applied to other types of production equipment to provide damage control stops, stops to minimize product damage, and automatic rapid production stops — *Wagner Electric Corp, 6400 Plymouth Ave, St Louis 33, Mo*—Booth 260

MORE DATA? Circle 376, inside back cover

SINGLE STATION, HIGH SPEED PUNCH PRESS with throat depth capacity of 30 in. Maximum work size is 30 x 30 in. This Super 30 Fabricator features quick-change punch and die system for changing sizes in 20 sec—*Wales Strippit Inc, Akron, NY*—Booth 340

MORE DATA? Circle 377, inside back cover



Reliance Numerical Programmer Operates Turret Drill Point to Point

Two-axis digital numerical control positions a Brown & Sharpe six-face turret drill mounted on a Lahr machine with a 90-in.-long fixed table. The drill head has 90 in. of programmed motion in one direction; 20 in. in the other. Turret selection is numerically controlled; spindle feed is not.

Input is by paper tape or rotary switches. Decimal readout is provided in the form of numerical indicator tubes. Zero datum lines can be reset to any position desired.

Position measuring is by three-speed synchro packages geared to the machine leadscrews. Resolution is 0.001 in. ±0.001 in. DC motors drive the head and saddle simultaneously.

Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17—Booth 411

MORE DATA? Circle 378, inside back cover

Console Cabinet for Controls Houses Electrical Equipment

Standard-design Model 14 console cabinet for machine-control equipment is made of 14-gage steel with welded construction and neoprene gaskets on doors and panel.

Removable panel is for mounting buttons, switches, and meters. Subpanels may be mounted inside. Fixed or swing-out panels and racks can be added from stock. Console measures 50 x 24 x 23 in.

Hoffman Engineering Corp, Anoka, Minn—Booth 408

MORE DATA? Circle 380, inside back cover

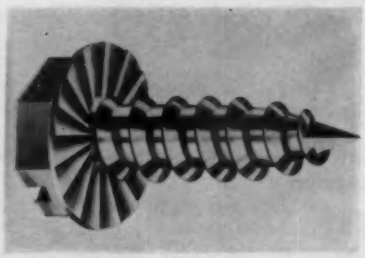
Cuno All-Metal Filters Clean Coolants, Lubricants

Auto-Klean all-metal edge-type coolant filters operate without interrupting fluid flow, and are continuously cleanable with manual or motor drive.

Cartridge replacement is not required. The units handle large quantities of fluid at low pressure, and take only about a fifth the space required for cartridge filters.

Cuno Engineering Corp, Meriden, Conn—Booth 529

MORE DATA? Circle 379, inside back cover



Tapping Screw Drills Its Own Hole, Has Serrated Washer-Type Head

Not only does this screw drill its own hole and form its own thread, it has an integral washer with serrated face that acts as a brake to minimize stripping and spinning. Called Tapits, the screw is designed to be driven by a quarter-inch power screwdriver with adjustable clutch. Only one size socket is needed, for all sizes of Tapits, from No. 6 to No. 10, have the same size hex head. The pyramid-type point starts drilling immediately, and will not walk, skid, or creep.

Parker-Kalon, Div of General American Transportation Corp, Clifton, N J—Booth 489

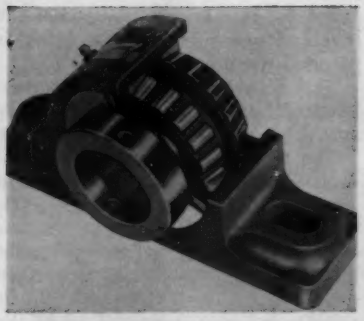
MORE DATA? Circle 381, inside back cover

Jiffy Bench-Model Disintegrator Removes Broken Taps, Drills

Bench-model D-1 disintegrating machine is the newest model in the company's line, which now includes five models priced from $325 to $1800. This unit can be purchased as a bench model or with a cabinet stand (illustrated) that makes it a floor-model machine. Capacity is ½-in.-dia hole or a 1-in. broken tap.

Jiffy Disintegrators, Inc, 1503 East Eleven Mile Road, Royal Oak, Mich—Booth 493

MORE DATA? Circle 382, inside back cover



Browning Introduces New Tapered Bearing Pillow Block

New tapered roller bearing pillow blocks feature unbreakable malleable iron housings, Timken tapered roller bearings, eccentric locking collar, labyrinth grease seals, and elongated bolt holes providing maximum interchange for this type block.

Completely assembled and ready for use, these tapered roller bearing blocks are available in 24 shaft sizes from 13/16—4 in.

Browning Mfg Co, Maysville, Ky—Booth 252, 254

MORE DATA? Circle 383, inside back cover

Star Tolerance Ring Imported To Take Up On Shaft, Bearing

A wedging circular member that is inserted between a shaft and bearing, the tolerance ring is an import from Europe, where it has many applications. The formed, ribbed sleeve has torque-transmitting ratings based on area. It allows some radial displacement in the bearing.

Applications are in ball bearings, bushings, gears, pulleys, and other rotating joints. The rings are said to eliminate temperature effects, allow wider tolerances between rotating members, and reduce machining time.

Imported by Roller Bearing Co of America, Sullivan Way, W Trenton, N J—Booth 117

MORE DATA? Circle 384, inside back cover

Led-Lok Socket-Head Capscrews Hold Against Vibration, Leaks

For seals against air, gas, oil, and water leaks, Led-Lok washers made by Safety Socket Screw Co extrude a soft-metal washer into the cavity formed between the screw head and the predrilled hole in the work. The screws are rated for torque set. The extruded metal also dampens the effect of vibration in the assembly, making the screw hold better than standard fasteners.

Safety Socket Screw Co, 6501 N Avondale Ave, Chicago 31—Booth 403

MORE DATA? Circle 385, inside back cover

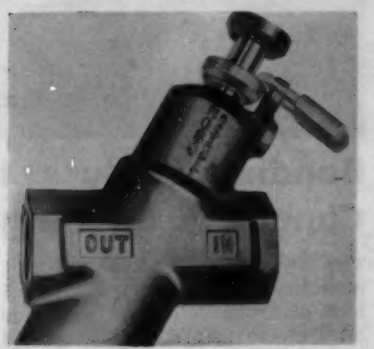
Special Winding Covers Improve Motor Performance

AC induction motors to be exhibited include standard horizontal motors with ratings from ¼ to 250 hp, vertical Holloshaft motors rated from 1 to 1000 hp, Varidrive variable-speed motors from ¼ to 75 hp, and controlled-speed systems utilizing these elements.

Two kinds of winding protection —Everseal silicone-rubber windings and encapsulated windings that resist damaging fluids and external conditions—will be shown.

U S Electrical Motors, Inc, Box 2058 Terminal Annex, Los Angeles 54—Booth 159

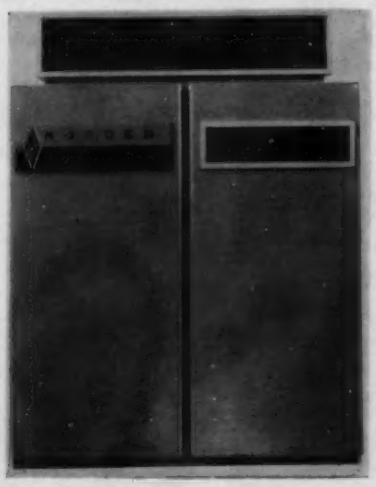
MORE DATA? Circle 386, inside back cover



L-O-X VALVE (lock out and exhaust) can be padlocked in closed position to cut off air supply to a machine or portions of a circuit. Air downstream of locked valve is exhausted. Valve is available in four sizes for ⅜—1-in. pipe—*Ross Operating Valve Co, Detroit, Mich*—Booth 220

MORE DATA? Circle 387, inside back cover

Norden Positioning Systems Have Manual, Punch Tape Control



The Series 600 (shown) and the Series 400 positioning systems provide manual, manual numeric, and punch tape control of cutting tool or workpiece position. The 600 features read-out of actual cutting tool or workpiece position. Therefore, operator or programming errors are quickly identified before initiation of the machining cycle.

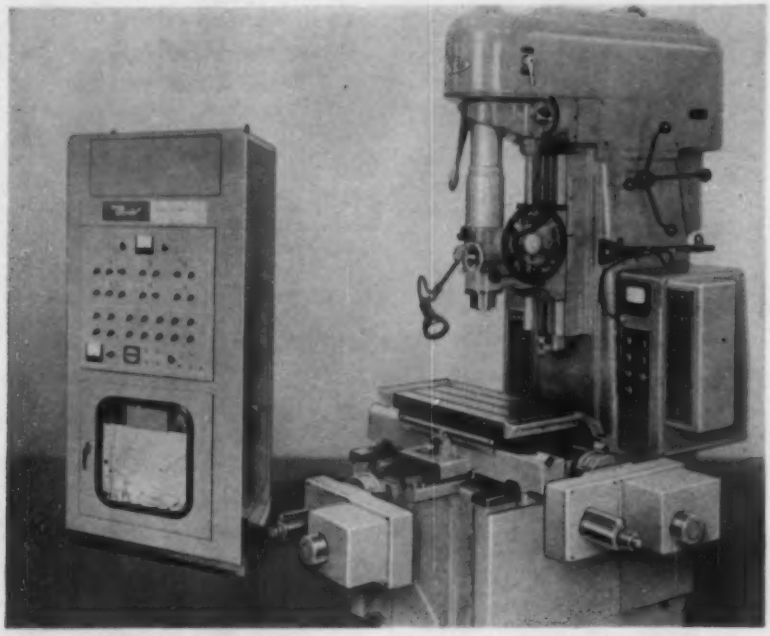
Modular or building block design of the Series 400 allows the user to purchase the exact degree of control and the specific features required for his particular application. It is available in two versions: The standard model is for jig borers, layout drilling tables, boring mills, and similar machine tools. A high speed version is particularly suited to drilling tables and other applications where rapid positioning is of prime importance.

The read-out feature on the Series 600—together with full range origin selection—provides the most economical machining of small-lot production lots by eliminating both tape preparation and operator calculations. Features of this system include: elimination of human error and time-consuming readings and calculations, automatic provision for offset calculation, and the numeric display of exact position.

Both systems take 8-channel tape.

Norden Div of United Aircraft Corp, 13210 Crenshaw Blvd, Gardena, Cal—Booth 221

MORE DATA? Circle 388, inside back cover



Bendix Introduces Its First Numerical Control Positioning System

The DynaPoint-20, Bendix's first numerical positioning system, is a high performance control, operating on a closed loop servo system and capable of an electronic resolution of 0.000,010 in. With this resolution, the unit can position the table of the Moore jig borer (with which it is being demonstrated) to tolerances of less than 0.0001 in. within the range of table travel. Motion is simultaneous in both axes.

The DynaPoint-20 is a compact, solid state unit, occupying only six square feet of floor space. Its mechanical tape reader uses standard 8-channel binary-coded decimal paper or plastic tape. Ten auxiliary functions may be programmed in addition to dimensional data, using standard Flexowriter codes.

Bendix Corp, Industrial Controls Section, 21820 Wyoming Ave, Detroit 37, Mich—Booth 530

MORE DATA? Circle 389, inside back cover

Wilson Microhardness Tester Easily Checks Work Specimens

The semi-automatic Model LL microhardness tester, with a relatively selective range of indentation loads from 25—1000 gm, has the ability to check work specimens with ease and reliability. Rugged in construction, it was designed to facilitate the testing of watch springs, surgical needles, drill rods, and cutting tool carbide tips.

In reality, the LL tester has taken the inspection of these delicate items out of the research laboratory and tool room and placed it on the production line.

Wilson Mechanical Instrument Div, American Chain & Cable Co, Inc, Bridgeport 2, Conn—Booth 361

MORE DATA? Circle 390, inside back cover

Electric Jig Grinder Gives Under 10 Microinch Finish

This new high torque electric jig grinder and carbide jig miller gives extremely accurate finishes to holes in hardened steel up to 3¾-in. dia. According to the manufacturer, tolerances within 0.0001 in. and surface finishes under 10 microin and assured by this grinder, provided the machine tool used for mounting is of good quality.

This grinder converts an accurate vertical milling machine into a low cost, high speed electric jig grinder.

The new grinder will be custom-built in limited quantities. It has a small, infinitely variable electric speed control allowing continuous regulation between 15,000—45,000 rpm. An automatic pushbutton feed mechanism allows the tool to be rapidly fed into the work while the spindle is running.

Precise Products Corp, Racine, Wis—Booth 625

MORE DATA? Circle 391, inside back cover

Traverse and Feed Panel Controls Machine Tool

Compact restyled control panel for hydraulic machine traverse and feed motions is for installation in minimum space, with the electrical actuating control mounted remotely. Directional motions are solenoid controlled, with coarse and fine feed rates cam controlled. Units are built to fit modular machine-tool units.

Vickers, Inc, Detroit, Mich—Booth 107

MORE DATA? Circle 392, inside back cover

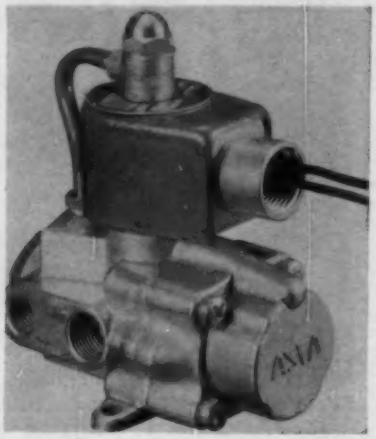
Wedgemount Supports, Levels Machine Tools & Equipment

Two matching metal wedges faced with molded vibration-absorbing pads are slipped together to raise or lower machine bases for levelling. A nut on a through stud is turned to change level.

The noise reducers are rated in four sizes for loads of 1000 to 12,000 lb. Top and bottom pads are "Air-Loc" parts that absorb vibration.

Clark-Cutler-McDermott Co, 130 W Central St, Franklin, Mass—Booth 227

MORE DATA? Circle 393, inside back cover



Automatic Switch Introduces Line Of Solenoid-Operated Valves

Latest additions to the Asco line of solenoid valves are the ¼-in. packless 4-way solenoid value (illustrated), the 1-in. general-purpose 2-way solenoid valve, the 3-position 4-way dual solenoid valve, and the midget 3-way "quick exhaust" solenoid valve.

The ¼-in. valve is designed to provide positive control of double-acting air or hydraulic cylinders. It operates on air, water, or hydraulic oil at pressures up to 250 psi and temperatures to 212 F.

The 1-in. general-purpose valve is widely used to provide automatic control of the flow of liquids and gases in a line. Applications include instrumentation, heating and refrigerating equipment, machinery, and machine tools.

Automatic Switch Co, Florham Park, N J—Booth 132

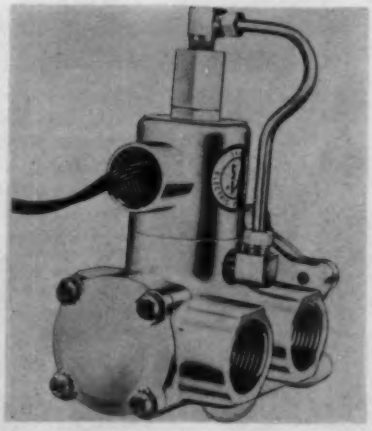
MORE DATA? Circle 394, inside back cover

Vibro-Finisher Controls Stroke Regardless of Load

Adjustable vibratory stroke of Selectro Vibro-Finisher is positive, unaffected by variations in load. Load drum can be instantly removed. Unit is claimed to deburr, burnish, and color parts that cannot be handled by conventional tumblers.

Production Equipment Corp, 2926 W Lake St, Chicago 12—Booth 514

MORE DATA? Circle 395, inside back cover



Skinner Electric Valves Control High Pressures

New ⅜-in.-orifice three-way "L" valves control air, water, and other fluids at differential pressures of 10 to 150 psi. Bodies are forged brass; internal parts stainless steel (illustrated).

Two-way high-pressure valves for DC operation at pressures of 5 to 1000 psi are controlled by voltage of 6 to 120 DC.

Stainless-steel 1/32-in. valves are available in two-way and three-way styles, and with ⅛ and ¼ in. ports. Maximum pressure is 400 psi.

Skinner Electric Valve Div, Skinner Chuck Co, New Britain, Conn—Booth 212

MORE DATA? Circle 396, inside back cover

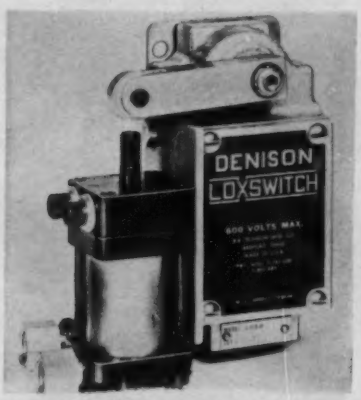
Lubrimatic Grease Cups Meter Feed to Bearing

Continuous lubrication when the equipment is in motion is the claim for Lubrimatic grease cups, which are equipped with clear Bakelite cylinders for visibility, spring and weight plunger, and a protective valve that seats when the cup is full to prevent overfilling.

The unit has grease-gun fittings for quick refills.

Lubriquipment Engineers, Inc, Box 9194, Ft Worth 7, Texas—Booth 475

MORE DATA? Circle 397, inside back cover



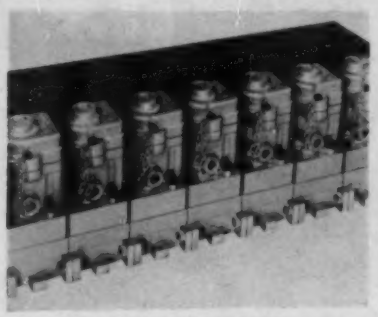
Air-Operated Actuator Gives Remote Control for Loxswitch

A new air-operated actuator permits the remote control operation of Denison Loxswitch Model L100W heavy duty limit switches. This assembly, part no. 2-1-1000, permits the mounting of a limit switch where maximum protection can be provided against moisture, dirt, vibration, and heat, as well as at locations which will facilitate wiring and maintenance.

This new device requires no air valve or air switch and therefore permits actuation in formerly inaccessible places. Actuation is provided by an orifice 5/32-in. dia, which may frequently be built in existing equipment.

R B Denison Mfg Co, 386 Broadway, Bedford, Ohio—Booth 406

MORE DATA? Circle 398, inside back cover



SEVEN-STATION MANIFOLD mounting is one version of solenoid air valve. Valve will be shown in 3-way, 4-way, and pilot types—*Ross Operating Valve Co, Detroit, Mich*—Booth 220

MORE DATA? Circle 399, inside back cover

Farrand Transistor Numerical Control Is Small, Low-Cost Unit for Machines

Inductosyn numerical control is designed to work from punched paper tape or input dial controls. Advantages claimed are low cost and small size. The unit is for application to machine tools, such as the illustrated jig borer.

Farrand Controls, Inc, 4401 Bronx Blvd, New York 70 —Booth 103

MORE DATA? Circle 400, inside back cover

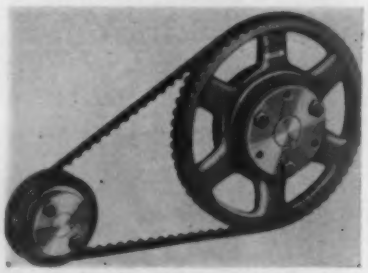
Auto-Tap Leadscrew Head Simplifies Precision Tapping

Ettco auto-tap unit allows unskilled workers to do precision tapping on any drillpress. The unit has an interchangeable leadscrew, sensitive cone clutch that runs in oil, positive depth control for blind or recessed holes. The leadscrew runs in a special-alloy bronze nut that adjusts for wear compensation. A rubberflex collet centers the tap accurately in relation to centerline.

The tapping clutch reverses at twice the speed of input. Tap and work spoilage are reduced because the leadscrew controls the tap. Model 62 taps holes from No. 0 to 5/16 in.

Ettco Tool & Machine Co, 594 Johnson Ave, Brooklyn 37, N Y—Booth 247

MORE DATA? Circle 403, inside back cover



Drive Gives Positive Action of Gears, Flexibility of Belts

Gearbelt drives engage matching pulleys with the positive action of gears, yet without their disadvantages. They eliminate metal-to-metal contact, lubrication, vibration, and chatter. Therefore, they require minimum maintenance.

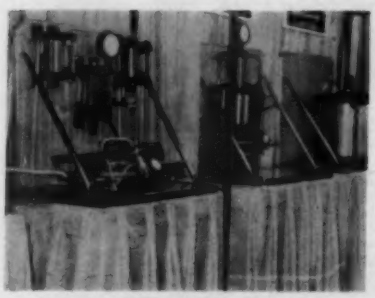
These belts, which provide a compact type of drive with high hp capacity, are ideal for slow speeds where slippage cannot be tolerated or for high speeds where lubrication is a problem. Belts and pulleys are available in sizes XL, L, H, XH, and XXH.

Browning Mfg Co, Maysville, Ky —Booth 252, 254

MORE DATA? Circle 402, inside back cover

SINGLE-FLUTE HSS spiral end mills cut non-ferrous metals at high speed. *Onsrud Cutter Mfg Co, 800 E Broadway, Libertyville, Ill*—Booth 501

MORE DATA? Circle 401, inside back cover



PROVEN BEST METHODS of selecting, pre-testing, and applying essential fluid power components will be shown at the Miller "College of Cylinder Knowledge"—*Miller Fluid Power Div, Flick-Reedy Corp, 7NO15 York Rd, Bensenville, Ill*—Booth 106, 108

MORE DATA? Circle 404, inside back cover

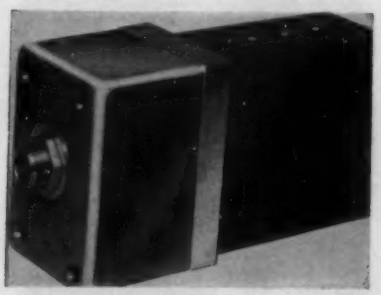
O-Ring Seal Keeps Dirt, Chips Out of Enco Turret Tool Post

This new O-Ring seal is said to do away with a maintenance problem commonly found in most machine shops and production departments. The seal, located in the base of the turret, positively prevents dust, dirt, and small chips from entering the mechanism of the turret tool post from the bottom.

A heavy equalizer spring keeps the tool block in contact with a washer at the top of the tool block; this prevents chips or dirt from entering at the top. The O-ring is retained in a ring groove in the base of the center post and makes external contact with an accurately machined recess in the tool block.

Enco Mfg Co, 4520 W Fullerton Ave, Chicago, Ill—Booth 468

MORE DATA? Circle 405, inside back cover



Electro-Hydraulic Valves Cost Less; Reject Dirt

Series SA-4 servo valves have flow rates from 0 to 37 gpm, and are said to have high response and good dirt-tolerance characteristics. Mechanical feedback linkage with unique variable fulcrum provides optimum flexibility to meet various conditions of flow, response, and pressure.

Vickers, Inc, Detroit—Booth 107

MORE DATA? Circle 406, inside back cover

DoAll Introduces Tungsten-Carbide Bandsaw Blade, Other New Blades

New tungsten-carbide bandsaw blade is said to cut two to three times faster than present blades, and to cut many materials now considered impossible to saw.

Another new blade, the 2-in. Imperial blade, with HSS cutting edge and a price far below an all-HSS blade, is reported to produce much more accurate cuts because its teeth are ground on all surfaces.

Super Demon blades, with their specially hardened tooth tips, last longer in cutting tough and abrasive materials. And the Dart, a carbon steel blade, has a greatly extended life as a result of a special manufacturing process.

DoAll Co, Des Plaines, Ill—Booth 116, 118

MORE DATA? Circle 407, inside back cover

General Radio Presents New Model Strobotac Tachometer

A completely new version of the stroboscopic tachometer, the Strobotac Type 1531-A, features a fundamental-speed (flashing-rate) range of 110—25,000 rpm and brilliant white flashes with duration of 1—6 microsec. These extremely short flashes can be used to freeze high speed motion of such rotating and reciprocating machine elements as cams, pulleys, governors, gears, fans, linkages, chains. No mechanical contact is required with the machine being measured.

A specially-developed Strobotron lamp produces the high-intensity flashes, with peaks of 0.21, 1.2, and 4.2 million cp on three ranges: high (4000—25000), medium (674—4170), and low (110—690). Single flash-rate peak is 7 million cp. Speeds up to 250,000 rpm can also be measured by using flashing rates that are submultiples of the speed to be measured.

The entire assembly is housed in a flip-tilt case that provides protection during transportation or storage, yet flips open quickly for use, resting on a table, held in hand, or carried by leather neck strap.

General Radio Co, West Concord, Mass—Booth 630

MORE DATA? Circle 408, inside back cover

Cam-Lok Cable Connectors Join Rapidly without Tools

Receptacles, plugs, and connectors encapsulated in high-impact plastic eliminate insulating panels, reduce assembly time, and prevent accidental short-circuiting by means of dead-front design. They are for direct mounting on panel boards, junction boxes, and for joining and extending portable wires.

Connectors have patented cam-locking design for positive, fast lock into position.

Cam-Lok div, Empire Products, Inc, Cincinnati, Ohio—Booth 427

MORE DATA? Circle 409, inside back cover

Metal-Clad Precision Switch Shows Light When Powered

Acro metal-clad precision switches are fitted with neon "on" indicator. Ratings range up to 21 amps, 2 hp.

Lightweight aluminum housings include replaceable switch elements, optional mounting holes, five different actuators, and single-pole, double-throw arrangement.

Acro div, Robertshaw-Fulton Controls Co, 2040 E Main St, Columbus 16, Ohio—Booth 306

MORE DATA? Circle 410, inside back cover

Mobile Vertical File Stand Holds 1200 Sheets 66 in. Long

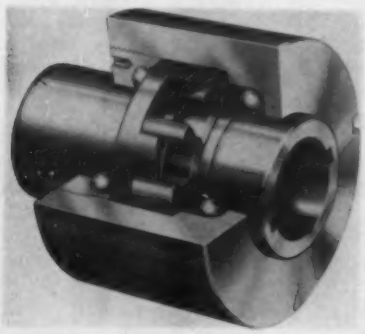
Redesigned Rolling Stand can be adjusted for filing sheets of any length up to 66 in. They can be used in batteries or back to back to hold plans, prints, and drawings. Made of 14-gage tubular steel, the stand is only 24" in. wide.

For greater capacity, a double rolling stand is available which holds up to 2400 sheets with a maximum length of 36 in.

Rolling Stand is priced at $36.95; the Double Rolling Stand at $26.95.

Plan Hold Corp, South Gate, Calif —Booth 369

MORE DATA? Circle 411, inside back cover



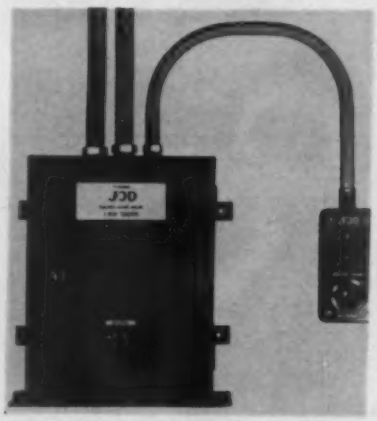
Formsprag Unit Stops Feedback Of Torque From Driven Member

Rev-Lok torque-locking and positioning device operates clockwise and counterclockwise to drive, position, over-run, and backstop. Sprags in the coupling wedge to prevent torque feedback.

Three elements, input shaft, output shaft, and outer race, permit several applications, depending on hookup. With the outer race fixed, it acts as a torque-feedback eliminator. With the output shaft locked, it operates as an over-running clutch —the outer race is then the output member. Two speeds are produced by gearing different motors to the outer race and input shaft.

Formsprag Co, Warren, Mich—Booth 325

MORE DATA? Circle 412, inside back cover



ACF Silicon Rectifier Control Limits Motor Armature Current

DC motor control with silcon rectifiers will operate a constant field at variable current simply as plugged into a single-phase line. Rating is 5 hp, with only 1.5 v drop compared to 15 v for thyratrons. Cabinet size is a quarter of that usually required —only 12 x 10 x 6 in.

The unit weighs 8 lb, runs cool, and has no delay. Speed reference is obtained from a Zener diode. The unit acts as a speed servo.

ACF Electronics Div, 11 Park Place, Paramus, N J—Booth 610

MORE DATA? Circle 413, inside back cover

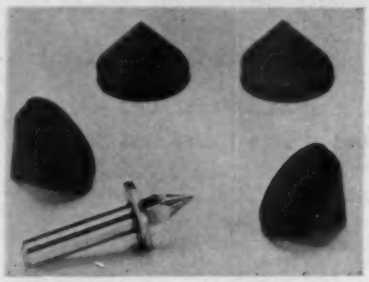
Standard Pressed Steel Has "Vibration-Proof" Fasteners

Unbrako self-locking socket head cap and setscrews, including micro-sizes, have tool and die and other machinery applications. The fasteners hold and stay tight under severe shock and vibration, are repeatedly reusable, stay locked at any depth, and need not be seated.

Screws are made self-locking by a nylon pellet, which is compressed under female threads of the tapped hole as the bolt is installed. This forces the mating threads together under considerable friction, and holds them tightly together.

Standard Pressed Steel Co, Jenkintown, Pa—Booth 232

MORE DATA? Circle 414, inside back cover



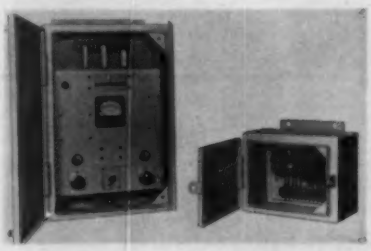
Rubber-Mounted Abrasive Cones Finish Holes and Chamfers

Small abrasive-cloth micro-cones adhesive bonded to disposable rubber heads are mounted on a unique steel mandrel to be operated by air or electric tools. The cones are available in several grits, and in two sizes; ¾-in. across with ¾-in. face at 60°, and ⅞ in. across with a ⅝-in. face and 90° angle.

The abrasive is either aluminum oxide or silicon carbide. The cones chamfer holes of 3/32-in. to ⅞-in. diameter.

Field Abrasive Mfg Co, 1303 Stanley Ave, Dayton 4, Ohio—Booth 500

MORE DATA? Circle 415, inside back cover



Electronic AC Load Monitor Responds to Actual Power

TorqueTrol, an ac motor-load monitoring device which responds to actual power, will detect very small motor load changes in a machine—as little as a fraction of one percent change.

The device monitors the motor torque, which is directly proportional to power. Because TorqueTrol re-

sponse is a function of power, it can detect load changes that current sensitive load controls cannot.

Clark Controller Co, Cleveland 10, Ohio—Booth 137-139

MORE DATA? Circle 416, inside back cover

Lufkin Dial Test Indicators Are Graduated to 0.0001 in.

This new line of dial test indicators offers many features, including wide range, easy-to-read 0.0001-in. graduations, swiveling contact point, jewelled movement, and a switch lever for full reverse action. Hardened chrome contact points are standard, but tungsten-carbide-tipped points are also available.

The Lufkin Rule Co, Saginaw, Mich—Booth 426

MORE DATA? Circle 417, inside back cover

Vibra-Check Cuts Machine Vibration and Noise

Anti-vibration material for installation under machine feet is claimed to reduce vibration noise 90%. High coefficient of friction (0.8%) and vacuum-cup surface design prevent machine creep and conform to rough or uneven floor.

Machine installation is easier and faster than with lag bolts. Material has 7500-psi compression strength.

Lowell Industries, Inc, Allston Station, Boston 34, Mass—Booth 333

MORE DATA? Circle 549, inside back cover

Collins Granite Box Parallels

Black-granite box parallels are a new item for inspection. Advantages of this material are great compressive strength, hardness uniformity, fine grain, and low moisture absorption.

Box parallels are added to a line of granite tools that includes surface plates, angle plates, and straightedges.

Collins Microflat Co, Hawthorne, Calif—Booth 424

MORE DATA? Circle 418, inside back cover

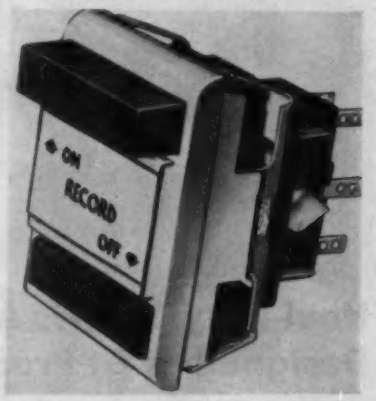
Clark Pulsolite Relays Work under Adverse Conditions

A heavy-duty, highly sensitive line of photoelectric relays—both the Pulsolite and Pulsolite Jr—are designed to operate under adverse conditions. They are considered ideal for use in atmospheres dense with foreign matter and where an extraneous light source could cause false operation in conventional units.

Uses of the relays include: door control, conveyor control, and intrusion alarms. The relays can even be used in the presence of paint spray and to detect the position of parts in ovens, kilns, or furnaces.

Clark Controller Co, Cleveland 10, Ohio—Booth 137-139

MORE DATA? Circle 419, inside back cover

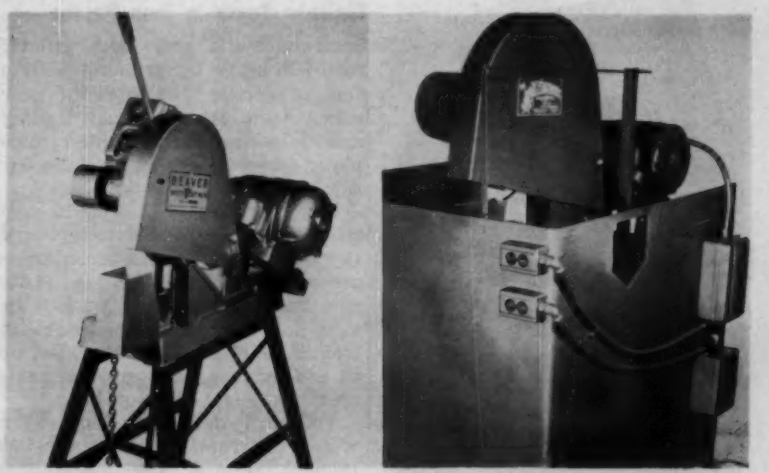


Cutler-Hammer Computer-Type Switches Include Light

UL-approved switches with maintaining and momentary contacts and panel lamps are designed for data systems, electronics, and aircraft and missiles. Plated contacts and quick action, make and break, promote long life. Standard current and voltage ratings are available. The switches mount flush in panels.

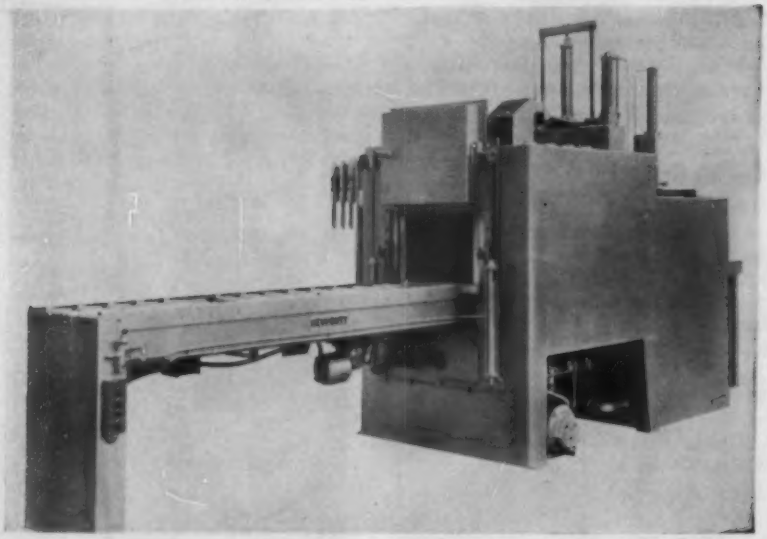
Cutler-Hammer, Inc, 315 N 12th St, Milwaukee 1, Wis—Booth 142

MORE DATA? Circle 420, inside back cover



SPEED-CUT ABRASIVE CUTOFF MACHINES, No. 14 (left) and No. 20, for wet cutting, feature new power head equipment. These machines handle shapes up to six in. and solids up to four in. Also being shown is a No. 20 Any-Angle machine—*Beaver Pipe Tools, Inc, Warren, Ohio*—Booth 141

MORE DATA? Circle 421, inside back cover



Hevi-Duty Electric Automatic Furnace Designed to Fit Production Line Work

This Clean-Line automatic heat treat furnace is designed to fit easily into production line operations where continuous automatic heat treating is required. The furnace makes possible step-by-step quality control in bright hardening, carburizing, carbonitriding, annealing, and normalizing operations.

Completely automatic from loading through quenching, the heat treat furnace requires minimum attention during operations. Because the controls are simplified, limited operator experience is needed. Once controls and automatic timers are set, the furnace takes over.

The Clean-Line automatically handles five operations in a straight-through heat treating process.

Hevi-Duty Electric Co, Div of Basic Products Corp, Milwaukee 1, Wis—Booth 368-370

MORE DATA? Circle 422, inside back cover

Commander Multi-Angle Unit Drills with Long Stroke

Model A multi-angle drill unit is a self-actuating attachment that can be adapted to several power sources for angle and special drilling operations. The equipment has built-in feed and return via an air cylinder with 4-in. stroke. The stroke length combines with the small diameter of the unit—1½ in.—to provide adaptability for unusual jobs.

Commander Mfg Co, 4225 W Kinzie St, Chicago—Booth 321

MORE DATA? Circle 424, inside back cover

Pre-Insulated Splice Cap Simplifies Electrical Work

Splice caps made with external tough clear Nylon for visibility are crimped by pneumatic or hand-powered tools to splice No. 12 to 18 wire. Insulation is checked for 600 volts on building wire and 1000 volts in fixtures.

Buchanan Electrical Products Corp, Hillside, N J—Booth 507

MORE DATA? Circle 425, inside back cover

Redin Gear-Deburring Machine Finishes Teeth in Two Passes

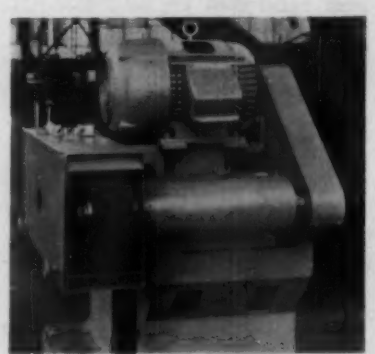
Semi-automatic gear-tooth grinder removed burrs by grinding with a floating spindle that rides the gear edge. Aside from manual loading and unloading, the machine completes a cycle by itself, finishing one side of the gear at a time.

The gear rotates at 1 to 10 rpm after the machine cover is closed (by the machine after the button is pressed.) Wheel speed is 11,000 rpm, maximum wheel size is 4 in. x ⅛ in., and gears handled range from 3 to 16 in. pitch diameter, up to a 6-in. face, and up to a maximum diametral pitch of 16.

The unit deburrs helical, spur, worm, internal, bevel gears and internal splines. The machine is completely guarded during its cycle.

Redin Production Machine Co, 2433 Twentieth St, Rockford, Ill—Booth 143

MORE DATA? Circle 423, inside back cover



Lathe Grinding Attachment Does Micro-Inch Finishing

This new design of grinding machine is built for mounting on heavy-duty lathes, mills, planers, or other machine tools where grinding operations are required. Equipped with a heavy taper nose spindle, it is capable of heavy stock removal and close tolerance size control. Low micro-inch finishing is limited only

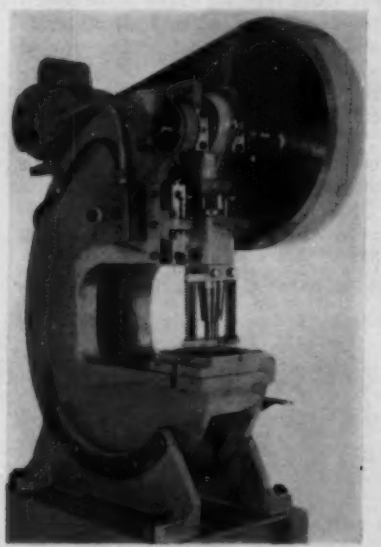
by the accuracy of the machine on which this attachment is installed.

The standard model can be furnished for either right or left-hand assembly and uses contact wheels of 12-in. dia and abrasive belts up to 4-in. wide, 86-in. long. The belt tension is maintained by air or hydraulic cylinder, and tracking control is within easy reach of the operator.

This device is arranged with a timing belt drive for a 5 hp motor and can be furnished for various belt speeds suitable for many grinding and finishing operations.

Production Machine Co, Wells St, Greenfield, Mass—Booth 410

MORE DATA? Circle 426, inside back cover

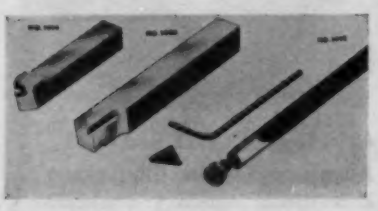


5-Ton Open-Back Punch Press Has Throat a Foot Deep

Di-Acro inclinable punch press features a deep throat for working to the center of stock as large as 24 in. wide and long.

O'Neil-Irwin Mfg Co, 512 Eighth Ave, Lake City, Minn—Booth 259

MORE DATA? Circle 427, inside back cover



Diamond & Carbide Tools Designed for Automatics

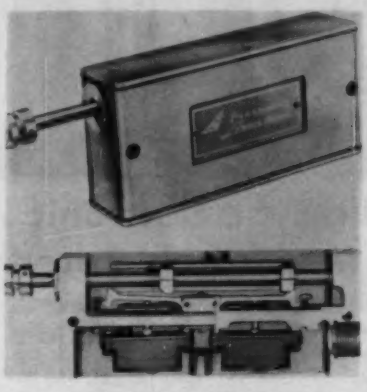
Diamond commutator-turning tool is specially designed for fractional-horsepower motors. Tool hardness and long life reduces tool downtime and eliminates grinding operation.

Carbide tool with ⅜-in. square bit at 15° shear is designed for cutting aluminum, copper, magnesium, and plastics.

Disposable carbide screw-tip boring bar is for deep, small holes. Tool shank is solid carbide for rigidity. The tools are for ¼ in. and up.

Arthur A Crafts Co, Boston 15, Mass—Booth 454

MORE DATA? Circle 428, inside back cover



Single-Unit Power Controls Operate Air, Oil Cylinders

Self-contained switching units for linear machine motions are completely enclosed and have only a single wire connection to the power line. Standard units are available from stock with ¼, 4, 8, 12, and 18-in. strokes. Up to ten switching operations can be enclosed in one aluminum body.

Switches may be mounted beside the power cylinder or at a remote location. The units are oilproof and easily adjustable.

Paramount Textile Machinery Co, 131 S Wabash Ave, Chicago 3—Booth 602

MORE DATA? Circle 429, inside back cover

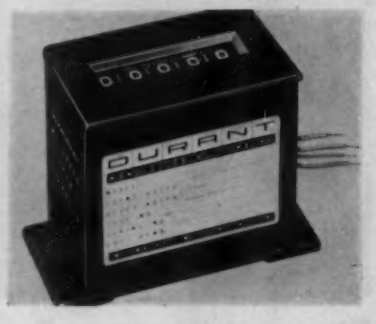
Heavy-Duty Air Grinders Range from 25,000 to 6000 rpm

Series B air grinders operate with ⅝-hp four-vane rotary air motors and range in speed from 6000 to 25,000 rpm in four models. Straight, right-angle, and extension styles are available.

These hand tools are equipped with sealed ball bearings in a contoured, serrated case. Tool weights range from 20 oz to 2 lb.

Field Abrasive Mfg Co, 1303 Stanley Ave, Dayton 4, Ohio—Booth 500

MORE DATA? Circle 430, inside back cover



Durant 'YE' Series Electric Counter Rated at Over 1500 CPM

This electric counter, which can be instantly reset to zero—either electrically or with a flick of the finger—is rated well over 1500 cpm without fear of mechanical breakdown or errors, according to the company. The case is finished in black, and is sealed against production dust, cutting fluid splash and spray.

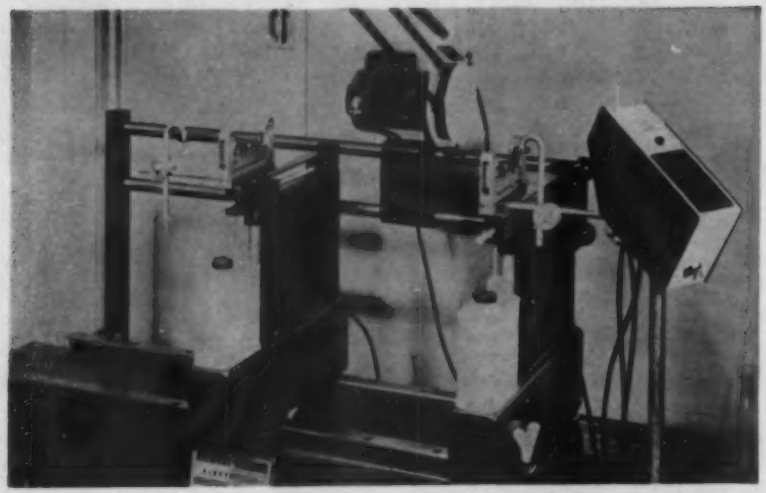
There are four models, base mounting or panel mounting, with push button instant reset or instant electric reset. The electric reset mechanism is entirely enclosed within the case.

Durant Mfg Co, 1945-PS N Buffom St, Milwauke 1, Wis—Booth 302

MORE DATA? Circle 431, inside back cover

LEVELING VIBRATION MOUNT, the LR-200, is a miniature Unisorb vibration mount with a built-in leveling screw. It is designed for use on office machines, air conditioners, and other small motorized equipment. Many other mounts will also be exhibited—*Unisorb, Division of The Felters Co, 210 South St, Boston 11, Mass*—Booth 359

MORE DATA? Circle 432, inside back cover



Stewart-Warner Cradle-Type Electronic Industrial Balancer Is Moderately Priced

Model 703 industrial balancer, priced at $3040 fob Denver, should enable even small plants and shops to be equipped for maintenance balancing, short run production balancing, motor rebuilding, and other balancing requirements in the medium weight and size ranges. Most significant design feature of the balancer, which replaces Model 702 in the line, is the tripod-mounted head containing strobe light, meter, and electronic unit.

Also available with the 703 is a conversion package with which the purchaser can have all the advantages of a portable balancer at an additional moderate cost. This package consists of a vibration pick-up, in choice of two rpm ranges, and an adaptor.

Some specifications are: Work range, ½—500 lb, ½—44 in. diameter, 4½—55 in. between bearing surfaces, 7½-in. dia trunnion capacity; 0.01 oz-in. max sensitivity (higher sensitivity available); ½ hp, 1725 rpm drive.

Stewart-Warner Corp, 1826 Diversey Pkwy, Chicago 14, Ill—Booth 465

MORE DATA? Circle 433, inside back cover

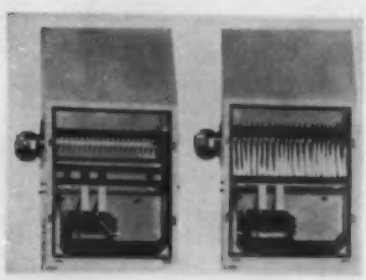
10-in. Universal Dividing Head Has Floating Index Plate

This Model E 10-in. universal dividing head is equipped with an exclusive floating index plate which provides a wider range of divisions and facilitates the setting-up of workpieces. Work can be held between centers, in chucks, or in collets.

With the use of an optional swivel base, this 10-in. head can also be used as a universal indexing fixture.

Nichols-Morris Corp, 76 Mamaroneck Ave, White Plains, NY—Booth 503

MORE DATA? Circle 436, inside back cover



Torit Dust Collectors Feature New Automatic Filter Shaker

A newly developed automatic filter shaker, now available on all models of Torit cloth filter-type dust collectors, shakes filters each time the dust collector is used. Therefore, this self-cleaning device eliminates the chance of a workman forgetting to shake filters manually.

The automatic shaker is powered by an independent electric motor mounted on the side of the collector. When the shaker bar is oscillated horizontally, its metal fins strike each cloth filter bag to free the dust particles and cause them to drop into the dust tray.

Suggested list prices range from $180—450, depending on the series of collector on which the shaker is used.

Torit Mfg Co, 1133 Rankin St, St Paul 16, Minn—Booth 401

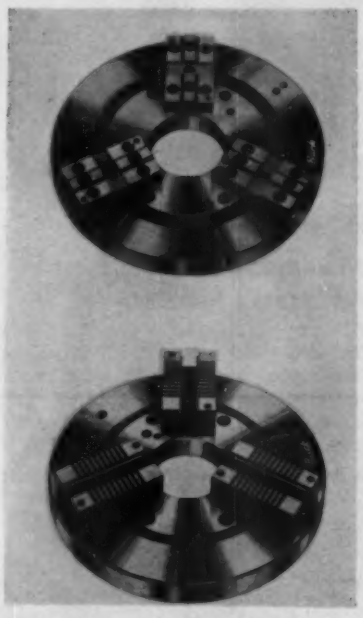
MORE DATA? Circle 434, inside back cover

Barry Heavy-Duty Mount

Vibration-control and isolating machine mount is built for machinery in the "mammoth" category—load rating is up to 64 tons per mount.

Barry Controls, Inc, Box 215, Watertown 72, Mass—Booth 387-389

MORE DATA? Circle 435, inside back cover



40% Lighter Chuck Bodies of Aluminum Feature Gib Takeup

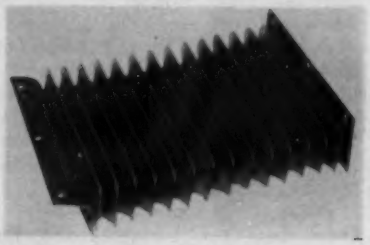
New Buck Ajusta-Tru aluminum chuck bodies save 40% in weight, and have gibbed keyways to take up wear. Newest chuck is 18 in. in diameter.

Jaw-turning fixtures (illustrated) hold top chuck jaws for machining,

or grinding after hardening, to true the jaws. Two types—serrated master, and American Standard tongue and cross key—are available; both hold jaws for truing within 0.001 in.

Buck Tool Co, 2015 Schippers Lane, Kalamazoo, Mich—Booth 244

MORE DATA? Circle 437, inside back cover



New Method of Fabricating Bellows Is Shown by A&A

These accordion-type pliable protectors are formed by vulcanizing the edges of neoprene coated nylon materials. The Vulca-Seal process allows a manufacturer to fabricate a fully oil-tight and air-tight bellows without the use of molds.

Protectors can be made in any size or shape to cover piston rods, spindles, vertical or horizontal screws, all shapes of machine-tool ways, and cross-rails.

A&A Mfg Co, 712 S 12th St, Milwaukee 4, Wis—Booth 481

MORE DATA? Circle 438, inside back cover

Schauer Speed-Lathe Models Feature Accessory Equipment

Two-speed 1-hp lathes for bench or pedestal mount can be equipped with collets, expanding mandrels, air chucks, vacuum chucks, magnetic chucks, and other holding fixtures. Lathe motors are fan-cooled for quick-repeated starts and stops without overheating.

New brakes enable split-second stops. Where air chucks are installed, built-in double-acting air cylinders exert 1500 lb of drawbar pull. Low-voltage solenoids mounted on the lathe control the cylinder without external hose connections.

Schauer Mfg Corp, Cincinnati 42, Ohio—Booth 322

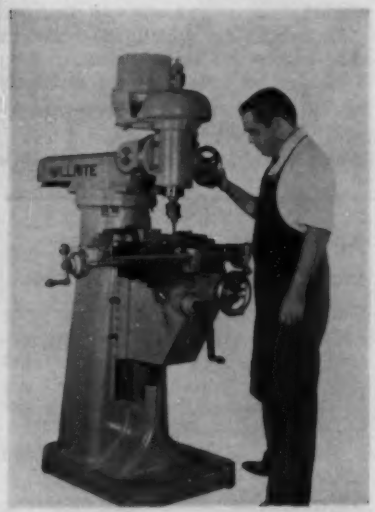
MORE DATA? Circle 439, inside back cover

Lufkin Magnetic-Base Magnifier Has Swiveling 5-Power Lens

No. 124 Handi-Magnifier has a 5-power lens that enlarges fine graduations and small parts for accurate measuring and inspection. The lens swivels a full 360° and tilts to any position. Unit is made of molded plastic and has a permanent magnet in the base.

The Lufkin Rule Co, Saginaw, Mich—Booth 426

MORE DATA? Circle 440, inside back cover



Low-cost Vertical Toolroom Miller Available in Several Designs

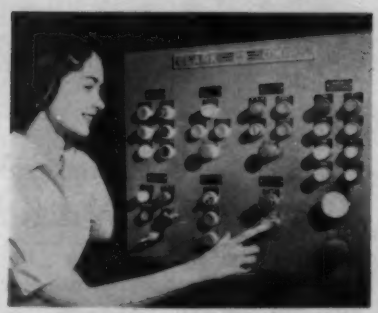
The Millrite vertical toolroom milling machine has the range and capacity of larger mills, yet is designed to sell for less than $1000. Basic ram-and-turret machine has a 7x27-in. table with longitudinal travel of 16 in., cross travel of 8 in., and vertical travel of 15 in.; ram movement of 12 in.; and a quill travel of 4 in.

Maximum distance from spindle nose to column face is 16 in. Maximum distance from nose to top of table is 18 in. The V-belt drive transmits full power of the ¾-hp motor at all six spindle speeds, from 250—3450 or 185—2550 rpm.

Several variations on the basic design will also be shown. The machine illustrated here is equipped with a compound swivel head for universal milling operations. Another machine will feature table powerfeed.

U S Burke Machine Tool Co, Cincinnati 27, Ohio—Booth 241

MORE DATA? Circle 441, inside back cover



Clark Controller Introduces Three New Push Button Lines

Each of three new push button lines has push button units, selector switch units, standard pilot lights, and push-to-test pilot lights or lighted push buttons. The three separate, but related, lines are:

- Type HO, Oiltight, open-hole (panel) or base mounted units, which are convertible from base to panel mounting and vice versa;
- Type H, NEMA 1, general purpose one-hole (panel) mounted buttons used for flush plates, operator's panels, and benchboards;
- Type H, NEMA 1, general purpose base mounted buttons for surface mounted enclosures.

Design features of the combined control unit lines include: interchangeability of many parts between lines; choice of 7 American Standard Safety Colors for both buttons and ferrules (this permits double color-coding arrangements); stationary terminals held solidly to contact blocks; fine silver, wipe-action contacts which permit reliable contact in all atmospheres.

Clark Controller Co, Cleveland 10, Ohio—Booth 137-139

MORE DATA? Circle 442, inside back cover

Hammond Electrolytic Cup & Tool Grinder Is Double-End Machine with Two Wheels

Low and medium-volume tool grinding and production grinding that requires an oscillating cup wheel is handled on Model CME-66. The mahcine is built in three styles; manual, conventional, or automatic spark control, with built-in or external Anocut Power pack.

A single motor-on-spindle grinding head operates two wheels. The head is insulated from the machine. Power-supply pickup is from the motor frame.

The chip-breaker end of the machine is fitted with a toolholding vise for tools up to 2½ in. wide. The table has 8 in. of stroke, handwheel elevation, and stops for fixed-position grinding.

The cup-wheel end oscillates at 60 strokes/min at an adjustable length up to 1½ in. Angle settings range from 10° above to 25° below horizontal.

Chip-breaker wheel is 6 in. in dia; cup wheel is the same.

Hammond Machinery Builders, 1600 Douglas Ave, Kalamazoo, Mich—Booth 432

MORE DATA? Circle 443, inside back cover

La Salle Alloy Steel Bar Eliminates Heat Treating Parts

La Salle's "e t d" 150 alloy steel bar, with minimum tensile strength of 150,000 psi, has a hardness of Rh32-36 C and machines readily compared to other alloy steels of similar hardness. It has been successfully roll-threaded and provides satisfactory finish and tool life.

This alloy takes the place of quenched and tempered bar steels and eliminates heat treating and costly secondary operations. The "e t d" (elevated temperature drawing) 150 is a 4100 series 0.40 minimum carbon alloy steel bar.

Available in rounds 7/16—3½ in., these bars are recommended for shafts, gears, pinions, fasteners, axles, and other parts to replace heat treated alloy steels. Tolerances range from 0.005 in smaller sizes to 0.008 in the larger. It may be ordered in either standard "as drawn" finish, or ground and polished finish. Strength is uniform throughout the bar.

La Salle Steel Co, 1420 150th St, Hammond, Ind—Booth 147

MORE DATA? Circle 445, inside back cover

Oil-Tight Limit Switches Withstand Impact, Vibration

C-H limit switches for machine applications are oil tight and resistant to impact and difficult environmental conditions. Seals keep out coolants, moisture, and abrasive grit. External seals are located at operating-shaft bearing and between cover plate and contact assembly. Internal seal is between operating head and base. Contacts are enclosed but visible through thermoplastic cover.

Both surface and flush mounts are

All-Electronic Welding Timer Includes "Automotive" Controls

General-application weld timer with controls as required by the automotive industry is equipped for internal plug-in variations. The unit conforms to JIC standards and is interchangeable with earlier models.

The machine provides high speed —450 spots per minute—and is not dependent on conductance of a tube for weld termination. Model 3B-5B is mounted on the side of the welder or on a wall or balcony. Size is 50 in. high by 16 x 16 in.

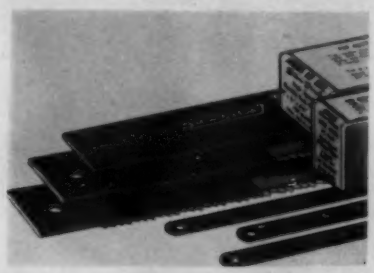
Weldtronic Co, 1950 Eight Mile Rd, Southfield, Mich—Booth 464

MORE DATA? Circle 444, inside back cover

available. Switches can be disassembled and components exchanged. Actuators include pushbuttons, levers, and rollers.

Cutler-Hammer, Inc, 315 N 12th St, Milwaukee 1, Wis—Booth 142

MORE DATA? Circle 446, inside back cover



Atkins Silver Streak Blade Claimed to Save 50% in Saws

Power and hack saw blades of improved metallurgy are said to outlast competitive blades 2:1 and save as much as 50% in blade costs to the user. Silver Streak is a companion line to Silver Steel tungsten blades. The blade material has high red hardness, suitable for cutting metals that work harden and are of high abrasiveness.

Atkins Saw Div, Borg-Warner Corp, Indianapolis 9, Ind—Booth 326

MORE DATA? Circle 447, inside back cover

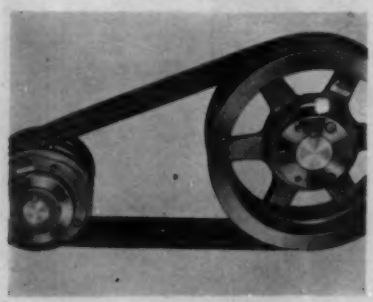
High-Speed Setscrew Driver Said to Cut Insertion Costs

The SPS Setomatic, an automated setscrew driver which will be in operation at the Show, drives up to 2500 setscrews an hour. It can serve either as an attachment to a single machine (as in photo) or as a building block in a completely automated production line.

In addition to automatically feeding and inserting, the machine tightens—to a predetermined torque—hexagon socket setscrews ranging from No. 4 up to ⅜ in. diameter, in lengths to ¾ in.—and can handle "square" screws (diameter equal to length). According to the manufacturer, the Setomatic cuts screw insertion costs, in some instances, to as low as 15 cents per 100 screws.

Standard Pressed Steel Co, Jenkintown, Pa—Booth 232

MORE DATA? Circle 448, inside back cover



Browning Announces New Line Of Variable Pitch Sheaves

A new line of MVP (multiple groove variable pitch) sheaves, with 360° adjustment, have a patented locking assembly which will not work loose. Because the sheaves are grooved after assembly, each groove is concentric with the other and a true running sheave is assured.

The sheaves are balanced, and since flanges do not rotate in adjustment, it will remain balanced. Adjustment is simple, and is effected by simply unlocking two screws and turning locking ring with a spanner wrench or punch.

Browning Mfg Co, Maysville, Ky—Booth 252,254

MORE DATA? Circle 449, inside back cover

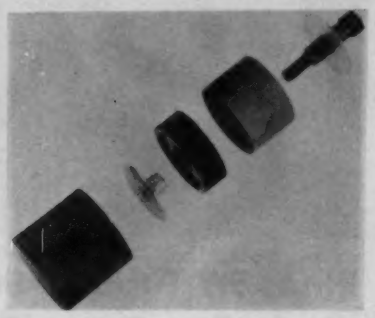
Glass-Fiber Machine Mounts Cut Vibration and Creep

Two lines of machine mounts for mobile rather than permanent machine installation are available in load ranges to 8000 lb. Model L (shown) mounts have built-in. level-adjusting screws; Model N is without adjustment.

Dampening material is high-density molded Fiberglas encased and bonded with neoprene. The company claims that 90% time savings can be made in installation or relocation work for machinery.

Consolidated Kinetics Corp. 1065 Dublin Rd, Columbus 8, Ohio—Booth 622

MORE DATA? Circle 450, inside back cover



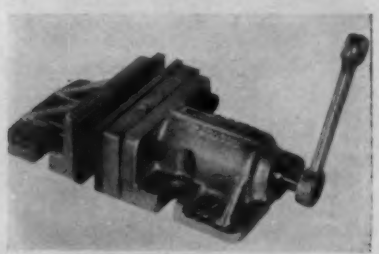
Hex-Lok Rubber Sanding Drum Prevents Cushion Shifting

A hex-shape inside front flange fits a hex formed in the rubber cushion of this sanding drum to prevent cushion shift as the tool operates. This flange is recessed to prevent its marring the work being ground or finished.

Design of the shaft is said to prevent chatter and increase abrasive-belt life. The drum assembly is available in standard sizes from 2 to 3-in. diameters in various face lengths. It is guaranteed to run true.

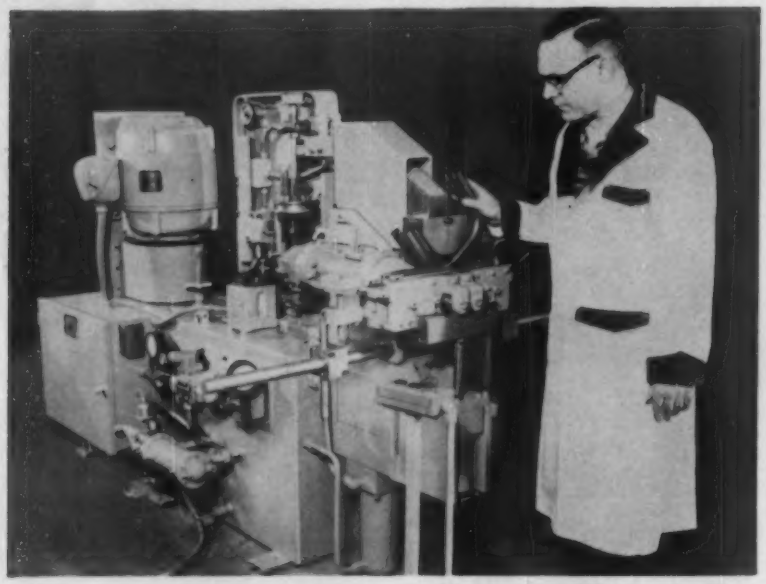
Field Abrasive Mfg Co, 1303 Stanley Ave, Dayton 4, Ohio—Booth 500

MORE DATA? Circle 451, inside back cover



QUICK-CLAMP MIL-VISE, available in 6-in. (shown) and 8-in. models, provides a clamping capacity limited only by length of machine table. Vise members of this two-piece set are keyed directly to table T-slot—*Nichols-Morris Corp, 76 Mamaroneck Ave, White Plains, NY*—Booth 503

MORE DATA? Circle 452, inside back cover

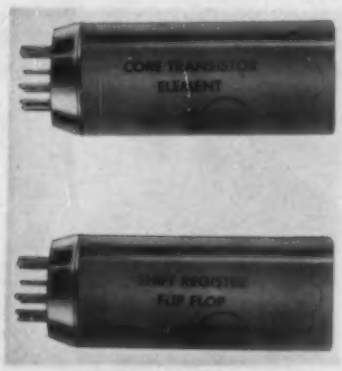


Pines 5-T Tubular-Stock Bending Press Works Two Parts at Once for High Speed

Model 5-T rotary bending press bends two pieces of tubing at each stroke, producing up to 1800 bends/hr. Capacity is two 1-in. x 0.065-in. steel tubes (16 gage) simultaneously. The unit produces U-frames, Z-shape side frames, and other two-part bends. It will also convert for single bends in stock up to 1¼-in. OD by 16 gage at production rates up to 1000/hr.

Pines Engineering Co, Aurora, Ill—Booth 266

MORE DATA? Circle 453, inside back cover

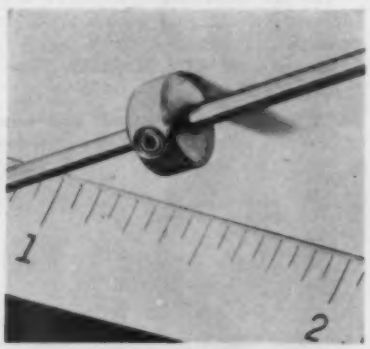


Magnetic-Core Circuits Plug Into Transistor Units

Digital systems and transistor circuits, as applied for numerical control and other machine regulation, are designed for frequencies up to 250 kc. They cost less than transistor circuits because, as "flip-flops," they operate with a single magnetic core, instead of the pair of transistors otherwise required.

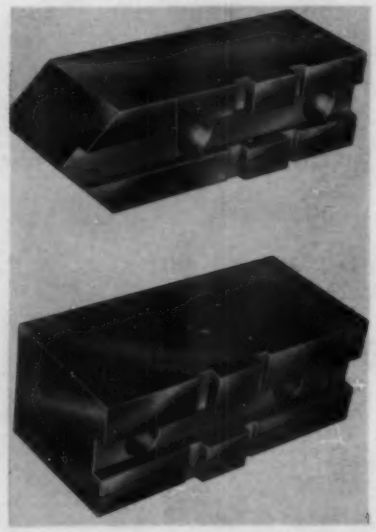
Engineered Electronics Co, 1441 E Chestnut St, Santa Ana, Calif—Booth 363

MORE DATA? Circle 454, inside back cover



MINIATURE STEEL COLLARS, sized for 1/16 and 3/32 in. dia shafts, are believed to be the smallest standard item of this kind yet offered. Complete with plain-cup-point socket setscrews for fastening onto the shaft, the new collars are designed to meet needs of miniaturization for taking up thrust; for locking, spacing, and positioning shafts; and for many other mechanical applications—*Standard Pressed Steel Co, Jenkintown, Pa*—Booth 232

MORE DATA? Circle 455, inside back cover

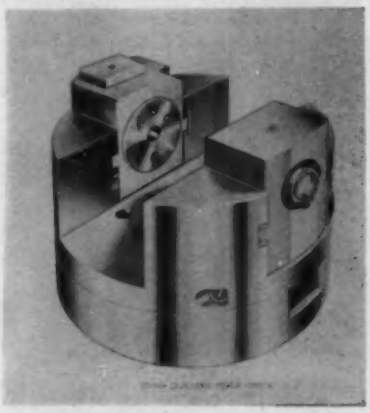


Soft Blank Top Jaws Fit All Standard Chucks

Serrated and tongue-and-groove chuck jaws are available in standard, extra-long, extra-high, and pointed shapes. Claimed to be less expensive than shop-machined jaws, they are low-carbon steel processed to resist rust. They are easily carburized, shaped, and hardened.

Skinner Chuck Co, New Britain, Conn—Booth 212

MORE DATA? Circle 456, inside back cover



Hand-Indexed Power Chuck Grips Plumbing Fixtures

Chuck for valve bodies, universal joints, and fixtures presents work for multi-surface machining or grinding without release. Jaws can be indexed under full pressure without touching the work, by means of slide plate and Allen wrench.

Skinner Chuck Co, New Britain, Conn—Booth 212

MORE DATA? Circle 457, inside back cover

Pre-Formed Corner, T Sections Aid in Installation of Raceways

A new line of pre-formed corner and T sections—named Redi-Korners and Redi-Tees—are for use with panel channel wiring raceways. These components eliminate much of the time-consuming hand work usually entailed in constructing a network of raceways for panel wiring.

Included in the line are Reducing Redi-Tees, so named because they form a connection between two wiring ducts of different widths. These make it possible to assemble a network of multiple-size panel channel raceways using all pre-formed parts.

All the components are made of a reinforced, thermosetting plastic that is strong, as well as lightweight, and absolutely flame retardant. They contain three elongated mounting slots in the bottom, and are available in black, gray, or white in all standard panel channel sizes.

Stahlin Brothers, Inc, 545 Maple St, Belding, Mich—Booth 345

MORE DATA? Circle 458, inside back cover

FRIDEN FLEXOWRITER, Model NC-1, produces and verifies punched tape used in automatic machine tool control for both point-to-point positioning (X and Y coordinates) and continuous path contouring—*Friden, Inc, San Leandro, Cal*—Booth 334

MORE DATA? Circle 459, inside back cover

Stewart-Warner Introduces New Monitor, Vertical Balancer

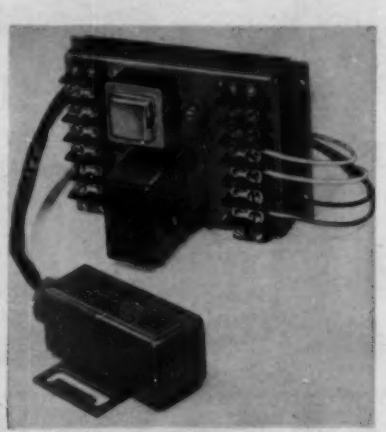
A new vibration monitor, for use in protecting equipment or processes which would be injured or damaged by excessive vibration, allows an acceptable vibration level to be pre-set. Then, a visual or audible alarm is set off whenever the pre-set level is exceeded. An exclusive feature is a plug-in balancer attachment which converts the vibration monitor into a portable balancer.

The vertical balancer is designed for balancing any rotating object which can satisfactorily be balanced using a single plane method. All objects of this type—such as clutches, fly wheels, sheaves, slicer blades—heretofore only statically balanced can now be given a rotating precision balance.

The electronic unit, strobe light, meter head, and vibration pickup, of the balancer can be taken to a vehicle to track down excessive vibrations in drive shafts, fans, pumps, or engines.

Stewart-Warner Corp, 1826 Diversey Pkwy, Chicago 14, Ill—Booth 465

MORE DATA? Circle 460, inside back cover



Honeywell Proximity Switch Detects Magnetic Material

Proximity switch has a separate sensor unit and a transistor amplifier with plug-in relay. It detects magnetic parts through a stainless-steel shell at an adjustable range of ⅛ to ½ in.

The switch operates a double-pole, double-throw relay, with the two elements of the switch up to 150 ft apart. 110 volts.

Micro-Switch div, Minneapolis-Honeywell Regulator Co, Freeport, Ill—Booth 271

MORE DATA? Circle 461, inside back cover

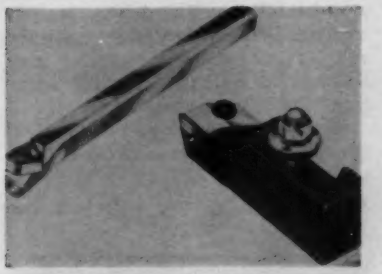
Side-Plunger Actuator Switches Fit in Close Quarters

Models LS and 200 LS actuator switches are maintained-contact, oil-tight units. Slide-roller-plunger versions, 3LS1 and 203LS1, are for fast-cam and slide actuation. Side-plunger versions, 4LS1 and 204LS1, are for slow cams and slides and where actuation is in line with the plungers.

Tight seals are provided with neoprene O-rings and sealed conduit. These are plug-in switches.

Micro-Switch div, Minneapolis-Honeywell Regulator Co, Freeport, Ill—Booth 271

MORE DATA? Circle 462, inside back cover



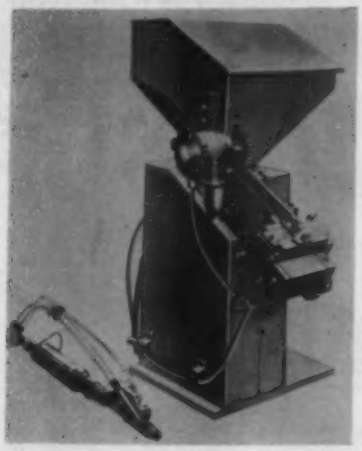
New Boring Bars for Carbide Inserts Come in Six Sizes

A complete new line of boring bars for triangular carbide inserts, in six sizes from ⅝—2½ in.

Also added to the Aloris line is a new profiling holder, for carbide inserts, which gives 32° clearance for plunge cutting. The holder, which is available for right and left hand turning, is furnished with fully adjustable carbide chip breaker clamps and a carbide shim, which protects the holder.

Aloris Tool Co, Clifton, N J—Booth 470

MORE DATA? Circle 463, inside back cover



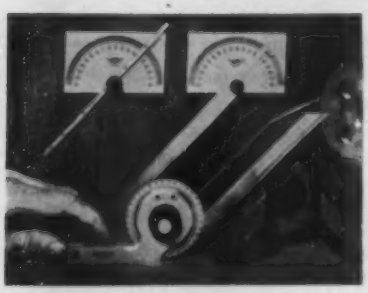
Automatic Screw Feeder-Driver Handles No. 2 to No. 14 Screws

The Jet-Setter JS-60 automatic screw feeder-driver is adaptable to all standard pneumatic and most electric screwdrivers. It is adjustable for use with screws of any diameter from No. 2 through No. 14, and is quickly convertible to any driver such as Phillips, slotted, hexagon, or clutch, and any head style. It also feeds and drives pre-assembled fastener-washer combinations such as Sems.

The larger motorized hopper holds and feeds up to a full day's supply of screws, and operation is so simple that even inexperienced operators can drive 40 to 50 screws per minute without fatigue. The driving unit is connected to the feeder by pressure and service tubes. Screwdriver may be used as much as 20 feet away from the hopper mechanism.

Parker-Kalon, Div of General American Transportation Corp, Clifton, N J—Booth 489

MORE DATA? Circle 464, inside back cover



Starrett Bevel Protractors Finished in Satin Chrome

Better visibility is claimed for a complete new line of Starrett hand tools and instruments, including bevel protractors (shown), micrometers, dial indicators, and other tools. All have Satin-Chrome finish that produces no glare, wears longer, and resists corrosion better than conventional tool finishes.

L S Starrett Co, Athol, Mass—Booth 150-152

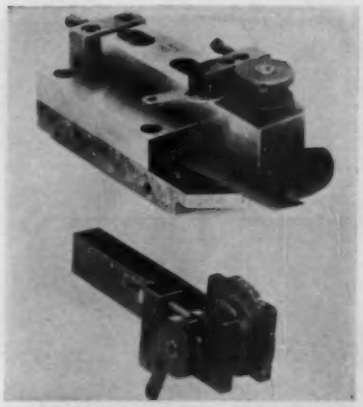
MORE DATA? Circle 465, inside back cover

Improved Diamond-Quill Bonding Cuts Freer, Lasts Longer

Diamond-impregnated quill has improved bond, permitting freer cutting because it is exposed from the body of the quill. Bonding and manufacturing technique allows about 1½ times the girth of the diamond to protrude from the bonding material. The quill will cut hardened steel without smearing. Under ideal conditions, it is claimed forty holes were ground with a 0.109-in. quill.

National Diamond Laboratory, Peekskill, N Y—Booth 299

MORE DATA? Circle 466, inside back cover



AUTOMATIC ROLL MARKERS will be seen in action on a No. 2 Brown & Sharpe automatic. Part will be formed on back slide, graduated on front slide, marked on the end from the turret, and marked and cut off from the vertical slide—*New Method Steel Stamps, Inc, 149 Jos Campau St, Detroit 7, Mich*—Booth 257

MORE DATA? Circle 467, inside back cover

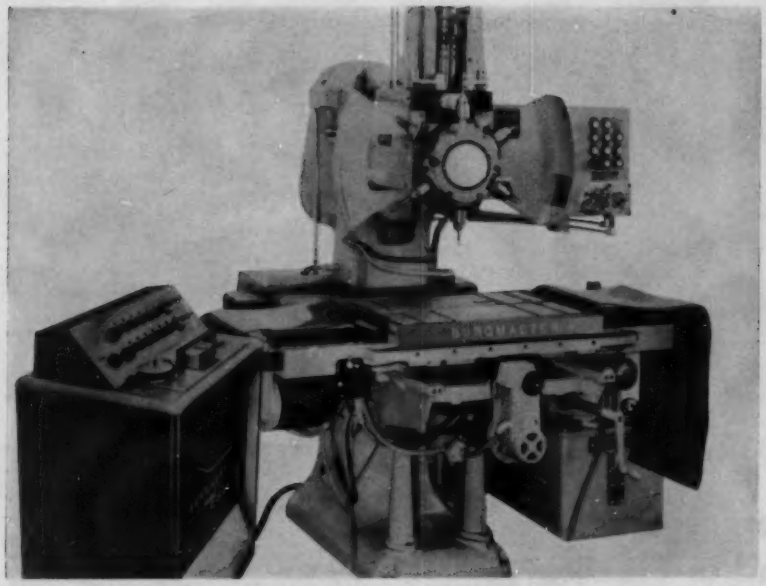
Tennant 7 1/3-ft Vacuum Sweeper Cleans Plant Areas, Industrial Yards

Said to be the largest vacuum sweeper yet developed, the Tennant Model 100 cleans a 7-ft, 4-in. path, yet turns in a radius of 9 ft, 2 in. The filter system has a capacity of 540 sq ft, and particle removal extends down to 5 microns.

It has a main broom and two gutter brooms that discharge dust and dirt into a 1¾-cu-yd hydraulically dumped hopper. Speed is 15 mph. The unit has power steering, power brakes, and cab.

G H Tennant Co, 721 N Lilac Dr, Minneapolis 22, Minn—Booth 160

MORE DATA? Circle 468, inside back cover



Bendix Shows Ferranti FP-22 System Positioning Workpiece to 0.0005-in.

Operating a Burgmaster turret drilling machine, the Ferranti FP-22 will position the workpiece to an accuracy of 0.0005-in., and control such auxiliary functions as tool selection, coolant flow, and spindle speed.

The FP-22 is a compact, completely transistorized unit which has many features not previously available in this country. Its diffraction grating measuring system is independent of the machine's drives so that table position is measured directly, and accuracy of the system does not depend on the position of the gearing and lead screws as in many systems.

The unit's floating zero facilitates quick set-up with inexpensive tooling, since the reference point may be located on the workpiece rather than locating the work to a specific zero point. Additional flexibility is provided by the manual dial input and position indicators.

Binary-coded decimal tapes for the system are prepared on standard Flexowriter equipment. The format includes a parity check for tape errors, while the feedback information is continuously checked by means of ternary logic circuits built into the system.

Dist by The Bendix Corp, Industrial Controls Section, 21820 Wyoming Ave, Detroit 37, Mich—Booth 530

MORE DATA? Circle 469, inside back cover

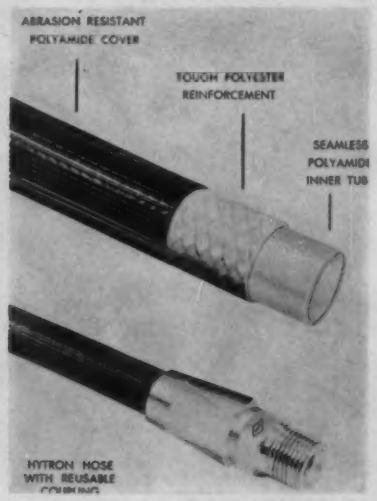
Chip-Tote Scrap Conveyor Handles Hot, Wet, Dry Chips

Advantages of 25% increase in production and 20% cut in machining costs are claimed for Chip-Tote automatic chip conveyor. Units in a wide range of sizes are constructed of standard parts that allow variations in width, length, and incline.

Removal speed can be matched to metal-removal capacity and rate of coolant flow.

May-Fran Mfg Co, 1710 Clarkstone Rd, Cleveland 12, Ohio—Booth 455

MORE DATA? Circle 470, inside back cover



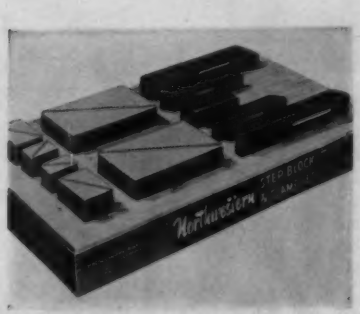
Plastic Inner-Tube Hose Takes Flexing, High Pressure

Imperial plastic hose for high-pressure applications is manufactured with high-tensile-strength polyester braid reinforcement in a special polyamide inner tube that provides superior flex-impluse strength and resistance to abrasion. The hose is claimed to offer smaller OD for equivalent pressure rating and ID size.

The material is non-aging and not affected by non-flammable fluids to 200 F and by flammable fluids to 225 F.

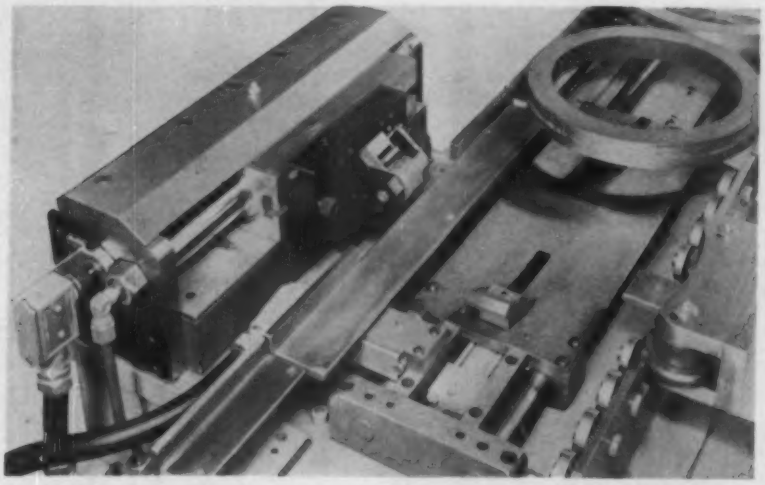
Imperial Brass Mfg Co, 6300 W Howard St, Chicago 48—Booth 450

MORE DATA? Circle 471, inside back cover



SETS OF ALUMINUM step blocks and heat treated steel clamps come in ⅜, ½, and ⅝-in. bolt sizes with standard aluminum blocks 1 in. wide; ½, ⅝, and ¾-in. bolt sizes with 1½-in. heavy-duty blocks; and ⅞ and 1-in. bolts with 2-in. heavy-duty blocks—*Northwestern Tools, Inc, 114 Hollier Ave, Dayton 3, Ohio*—Booth 416

MORE DATA? Circle 472, inside back cover



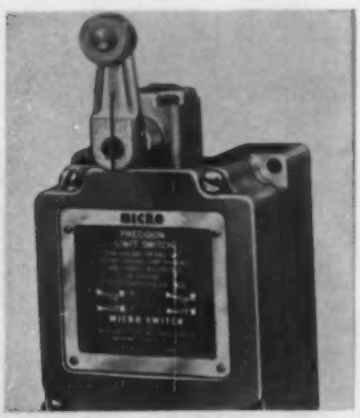
Marking Machine Conveyor-Fed For Identifying Round or Flat Parts

Model 465 GTS hydraulic marking machine has a basic design easily adaptable to a wide range of round or flat parts with GTS custom-engineered tooling.

Gear blanks are marked by the illustrated unit, which has an automatic shuttle feed and a serial-numbering head. Feed fingers carry parts to retractable cradle in which parts are marked. A hydraulically operated die slide moves in to roll the numbering head against the work. Parts are discharged to a conveyor.

George T Schmidt, Inc, 4100 Ravenswood Ave, Chicago 13—Booth 233

MORE DATA? Circle 473, inside back cover



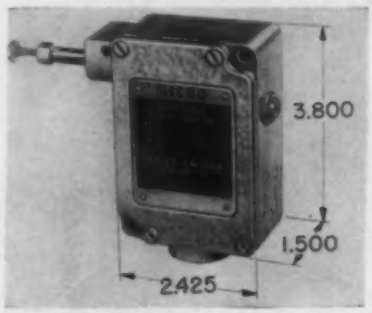
Center-Neutral Plug-In Switch Does Double Switching Duty

Model 301LS1 plug-in switch contains two 2-circuit double-break basic switches that can control four circuits at once. The roller lever actuates one basic switch when moved right, another when moved left.

The purpose is to simplify actuating systems and reduce wiring and space requirements. Switches are mounted in die-cast housings. Switches can be replaced in 20 sec.

Micro-Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill—Booth 271

MORE DATA? Circle 474, inside back cover



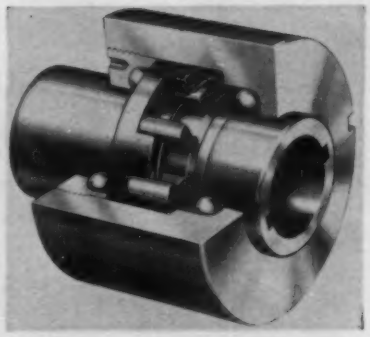
Precision Switch Produces Single Electrical Pulse

Adjustable industrial pulse Micro Switch 1PD1 pulses the switch contacts open or closed as the plunger is depressed; no switch action occurs as the plunger retracts. Operating force is 4 lb, total plunger travel is 0.6 in.

The design is useful for air valves where permanent-duty solenoids are not applied. Switch is oil-sealed and available in ratings from 10 to ¼ amp at up to 480 VDC.

Micro Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill—Booth 271

MORE DATA? Circle 475, inside back cover



Rev-Lok Drive Clutch Eliminates Reverse Feedback

Two opposing sets of sprags completely block reverse torque feedback in the Rev-Lok clutch. It operates clockwise and counterclockwise to drive, position, overrun, and backstop.

Formsprag Co, 23601 Hoover Rd, warren, Mich—Booth 325

MORE DATA? Circle 476, inside back cover

Transistor 12-V Power Supplies Operate Laboratory Equipment

Rack-mounted power supplies are both 12 volt, rated at 1 and 5 amps. These are power sources for computer elements, or for numerical-control equipment. Sizes are 5¼ x 19 in. by 16 in. deep.

Load regulation is 0.1%. Temperature limits are —20 to +65 C. The 5 amp unit is a dual supply for two separate loads.

Engineered Electronics Co, 1441 E Chestnut St, Santa Ana, Calif—Booth 363

MORE DATA? Circle 477, inside back cover

Norden System Inspects Parts By Measuring Their Shape

A new Norden concept — programmed dimensional inspection—makes possible automatic inspection of parts by measuring their exact shape and contour. Since each point on the part's surface has a digital value, this information can be easily programmed. Corresponding points on the actual part are

then probed automatically and their dimensions compared with the programmed information.

Input for the system can be either manual, manual numeric, or from punched tape; output can be provided as decimal display, print-out, or a standard eight-channel punch tape record. The system is absolute rather than incremental, and provides either actual dimensions, deviations from nominal values, or out of tolerance indications.

Norden Div of United Aircraft Corp, 13210 Crenshaw Blvd, Gardena, Cal —Booth 221

MORE DATA? Circle 478, inside back cover

Dial-In Size-Setting Gage Holds Precision Without Blocks

Precision size-setting bench gage built by Sunnen is fitted with two dials, anvils, and precision leadscrews. Size range is 0.375 to 2.000 in. Size is dialed into the gage, then a part is checked or standard set between the anvils.

Accuracy is to 0.000,025 in. Thus the gage replaces gage blocks and other special measuring tools.

Sunnen Products Co, 7900 Manchester Ave, St Louis 17, Mo—Booth 327

MORE DATA? Circle 479, inside back cover

Aero Precision Switches Have Clip-On Construction

Molded-in terminals and blind tapped holes are features of Acro precision switches, Models B and F.

Rolling-spring principle prevents contact bounce. Step and flat bases are available; and conventional ratings are built.

Acro div, Robertshaw-Fulton Controls Co, 2040 E Main St, Columbus 16, Ohio—Booth 306

MORE DATA? Circle 480, inside back cover

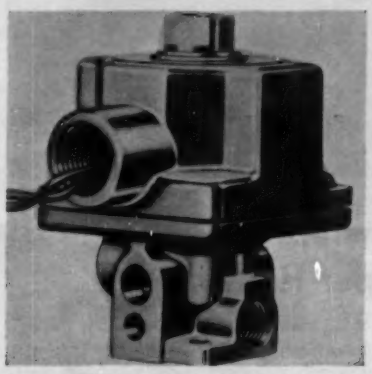
Magnaflux Offers Portable Ultrasonic Thickness Tester

A fully transistorized battery-powered Sonizon SO-300 measures directly the thickness of steel, brass, nickel, copper, aluminum, and virtually every material which transmits ultrasonic sound. By simply placing a probe on the surface of the piece to be measured and rotating a dial, the SO-300 gives an instantaneous reading of thickness.

Improved features include a rugged chassis, greater sensitivity, simplified controls, and easier, direct read-out.

Magnaflux Corp, 7300 W Lawrence Ave, Chicago 31, Ill—Booth 400

MORE DATA? Circle 481, inside back cover



Skinner Three-Way Valve Has AC and DC Operation

"A" series electric solenoid valve controls pressures up to 250 psi at any port. Orifice sizes are 3/32, 1/8, and 5/32 in.

Skinner Chuck Co, New Britain, Conn—Booth 212

MORE DATA? Circle 482, inside back cover

Barry Shaper Side-Thrust Mount

A horizontal-force machine mount that reduces vibration transmission and provides easily removed machine-location pads is built for equipment with side thrust, such as shapers and forging machines.

Barry Controls, Inc, Box 215, Watertown 72, Mass—Booth 387-389

MORE DATA? Circle 483, inside back cover

Screw-Machine Package Converts for Air Chucking

Skinner power package for B & S automatic and hand screw machines and similar machines converts them for air-powered chucking. The assembly has a 4-in. chuck with two or three jaws, work ejector, drawbar, rotating air cylinder and cylinder adapter.

Accessories include jaws, hose, fittings, air filters, and control valves.

Skinner Chuck Co, New Britain, Conn—Booth 212

MORE DATA? Circle 484, inside back cover

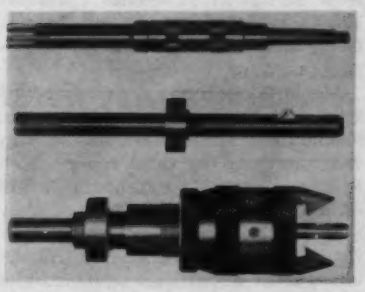
Selective Paper Duplicators Reproduce Fully or in Part

Selective copying machines will reproduce all on the master or selected data in condensed form. They will condense and shift lines, and strip masters or shingled forms.

Electronic models select lines from a form in any combination for runoff. They allow posting lines as selected to ledger cards. The machines operate by pushbutton.

Copy-Craft, Inc, 105 Chambers St, New York 7, N Y—Booth 258

MORE DATA? Circle 485, inside back cover



Cogsdill Offers Five Timesaving Tools

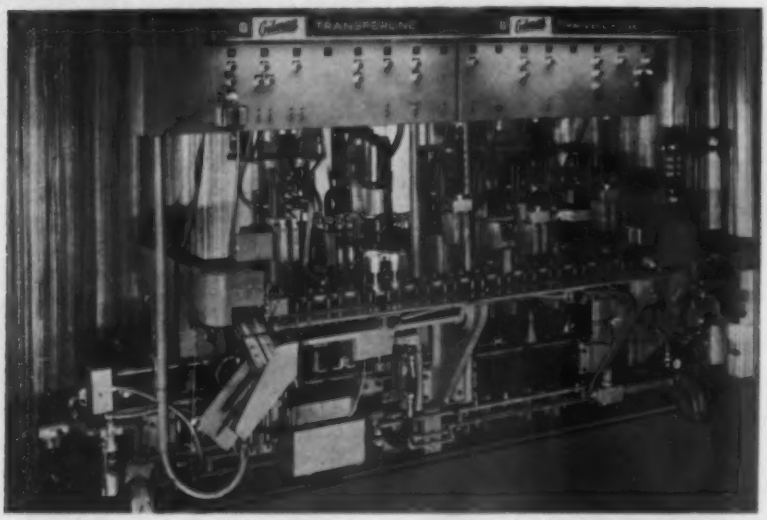
Roll-A-Finish tool (top) exerts steady pressure against work surface as tapered rolls ride up inversely tapered mandrel, increasing tool OD and reducing 80-200 mu-in. surfaces to less than 10 mu-in.

Type C BurrAway tool (center) is designed for materials of limited thickness, fits any spindle, removing feather edges and burrs while being operated from one side of piece. ContourBurr (bottom) chamfers inside edges of tubing cross holes, can be mounted on any spindle, gives burr-free chamfers on holes up to ½ of tubing OD.

Not shown: TuBurr, which chamfers OD and ID and faces tube ends, is designed for screw machines or tube-finishing machines; and a chatterless countersink.

Cogsdill Tool Products Inc, 12980 W 8 Mile Rd, Oak Park, Mich—Booth 515

MORE DATA? Circle 486, inside back cover



Gilman 16-Station Transferline Turns Out 2880 Pieces per Hour

New 16-station automatic Transferline will be demonstrated assembling 2880 six-piece Parker ball pen caps an hour.

Machine, which uses standard straight-line transfer and loading mechanisms throughout, has all stations actuated by cams mounted on a single camshaft extending length of machine.

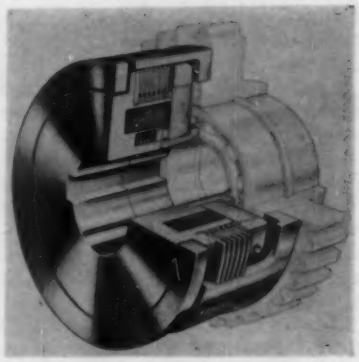
Building-block design permits modification of line for model changes at about half usual cost of retooling an automatic assembly machine.

Another Transferline, this one with 14 stations, also will be shown with sample *standard* stations mounted and operating—showing range of assembly operations possible with unitized patented station movements and other standard components and controls.

Also on display will be three basic Gilman dial-type Indexamatic units for dial- and carousel-type assembly machines, and standardized untooled bases for mounting index units and standardized station movement mechanisms.

Gilman Engineering & Manufacturing Co, Eastern & Ogden Avenues, Janesville, Wis—Booth 205

MORE DATA? Circle 487, inside back cover

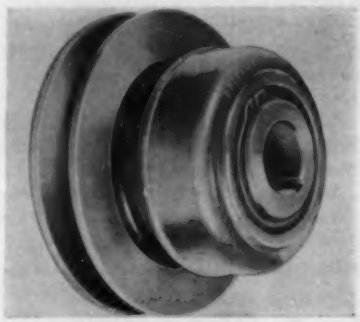


Elmag Multiple-Disk Clutch Skirts Design Restrictions

So designed that the magnetic flux does not pass through the disk stack—making design restrictions with regard to magnetic circuit requirements nil, multiple disk clutch allows the use of various friction materials that are suitable for both oil or dry clutch applications.

Eclipse Machine Division, Bendix Corp, Elmira, NY—Booth 614.

MORE DATA? Circle 489, inside back cover



Variable-Pitch Sheaves Adapt to Single V Belts

These type "SL" spring-loaded sheaves, available in several sizes, can be adapted to nearly any machine that uses a single V-belt. The variable-pitch units may replace ordinary sheaves, and will cover a wide speed range, with a simple adjustment of center distance. Four sizes—in ODs of 3, 4, 5, and 6 in.—are available.

These spring-loaded sheaves may be used either as driver or as driven.

Browning Mfg Co, Maysville, Ky—Booths 252-254

MORE DATA? Circle 490, inside back cover

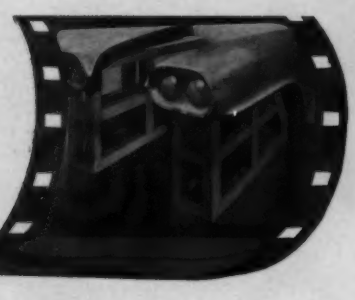
Engis Presents Full Line of Metrology Equipment

Complete line of analytical metrology equipment for machines, tools, and work includes machine tool scales and projectors with sealed built-in zero-setting arrangement direct to 0.0001 in., auto-set optical level with micrometer reading to 0.001 in., a compact test and calibration fixture for optical tooling instruments (photo), an automatic level with variable sensitivity of 1 to 20 seconds, and a new microalignment telescope for auto-collimating and direct reading to 0.002 in., with projection and camera attachments. Also on display: a full selection of auto collimators (including photoelectric), and autocollimating theodolite with direct reading to 1 second, Talysurf Model 100—a semi-automatic surface-finish measuring instrument; and a Microptic Auto Collimator.

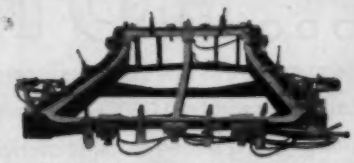
Engis Equipment Co., 431 S Dearborn St, Chicago—Booths 467-69

MORE DATA? Circle 488, inside back cover

TOOLING SAVINGS...



SAVED—$7,500 IN COST, 6 WEEKS IN DELIVERY!



This hood welding fixture is a combination of steel base casting with a surfacing of Ren plastics. Prior to the application of epoxy resin, this fixture was tooled in steel at a cost of approximately $10,000 in 8 weeks. Today's cost in plastic—under $2,500; delivery in 2 weeks!

SAVED—$7,000 IN COST
6 WEEKS IN DELIVERY!

This hydroform die for an aircraft application is a mass casting constructed from a plaster mold. Originally quoted in steel at $10,000, 8 weeks delivery. Using Ren plastics, this die was fabricated in 10 days at less than $3,000!

SAVED—$4,000 IN COST,
2 WEEKS IN DELIVERY!

This mass casting, backed up by sand and gravel, is a form block for the rear roof of a bus. Patterned from a plaster mold, this casting was produced for $2,450—at a savings of $4,000 over conventional methods!

SAVED—$15,500 IN COST, 6 WEEKS IN DELIVERY!

This fixture is designed to check an overall front end automotive alignment. Completely fabricated of Ren epoxy laminating materials, glass, cloth and tubing, this fixture costs approximately $2,500 and was built in eight weeks. Former cost, using conventional methods $18,000; de-

USING ren EPOXY RESINS

Plastic tooling saves both time and money—
often in surprising amounts!
For maximum benefits, start by selecting the proper application—and Ren epoxy resins.
Ren provides a background of extensive plastic tooling applications—plus 17 invaluable years of epoxy research and formulation.

For tooling applications that you suspect may be done faster—
more simply—at less cost—consult with your Ren Plastics representative.

ren *plastics, inc.*
Lansing 9, Michigan

ARE YOU RECEIVING YOUR FREE COPIES?

Published periodically by Ren, these bulletins provide technical information and applications of plastic tooling. If you are not presently receiving your free copies, fill-in and mail this coupon.

Ren Plastics, Incorporated
5422 South Cedar Street,
Lansing 9, Michigan
Gentlemen: I would like to receive
Tooling Digest

Name_____
Address_____
City_____ State_____
Company_____
Position_____
Send me more information ☐

... HOT

Temperature in this stainless steel rotary salt dryer will be 1600°F from combustion gases. It's used to demoisturize salt, one step in making high octane gas. C. O. Bartlett & Snow was the fabricator. They chose stainless steel because of its outstanding high temperature strength and resistance to high temperature oxidation.

COLD...

—443°F is only 16.4 degrees above absolute zero. That's one reason stainless steel is used in this heat transfer unit that helps simulate outer space conditions of near absolute zero temperature and one-billionth of an atmosphere. The all-stainless unit is named "PLATE-COIL," manufactured by Tranter Manufacturing, Inc., Lansing, Michigan.

This mark tells you a product is made of modern, dependable Steel.

...and in between

No material can match stainless steel's versatility. Stainless steel offers designers and fabricators a unique combination of properties: superior strength, extraordinary corrosion resistance to an enormous variety of reagents, outstanding high temperature properties, and appearance. It is easily fabricated and, because stainless steel lasts longer, actually costs less in the long run. If you have a selection or delivery problem, ask your USS representative or nearest steel service center.

USS is a registered trademark

United States Steel Corporation—Pittsburgh
American Steel & Wire—Cleveland
National Tube—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company
United States Steel

UP TO 40 TIMES LONGER WEAR

LINDE's FLAME-

—the 6,000-degree, supersonic process that "welds" tungsten carbide and other materials to working surfaces—giving them today's greatest resistance to abrasion, galling, erosion, fretting, corrosion, and high-temperature wear

LONGER service life . . . less down time . . . fewer rejects . . . reduced operating costs!

These are only a few of the important advantages that LINDE's Flame-Plating process builds into machines, parts, accessories, and products that depend on the stamina of metal surfaces for required performance. Exclusive Flame-Plating guns literally "blast" molten particles of tungsten carbide or aluminum oxide at specific areas—at 2,500 fps—depositing a hard, welded-on coating which can be precision-finished to the desired microinches rms.

Dimensional stability unchanged

While temperatures above 6,000°F are reached within the oxy-acetylene detonation gun, the temperature of the work piece is maintained below 250°F. This eliminates warpage or distortion of even minute precision parts.

Depending on thickness of finish applied, or use of the wearing part, Flame-Plating has been known to multiply wear resistance more than 40 times.

Hundreds of potential applications

Other properties include low coefficient of friction, porosity less than one per cent, and excellent corrosion resistance. Coatings show outstanding reliability under high temperature, heavy load, and lack of lubrication or cooling.

The list on the right-hand page (opposite) shows a few of the many current and possible applications for Flame-Plating. Perhaps the process could be used profitably in one or more of your operations. We suggest you indicate your possible applications on the coupon and mail today for more information.

ROBESON CUTLERY

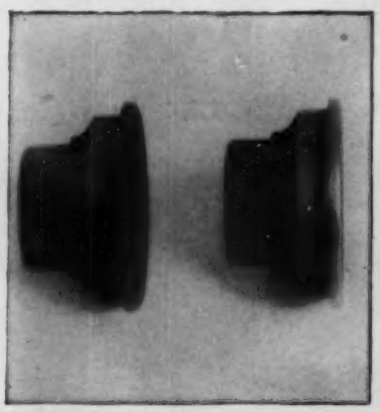
LINDE's Flame-Plating provides Robeson Cutlery Co., Inc., with a distinctive merchandising theme. The Robeson line of *"Flame Edge"* cutlery is featured as "The Greatest Development in 2000 years of Cutlery Making —a Cutting Edge of Tungsten Carbide."

LAWSON PAPER DRILLS

Paper manufacturers report increases in drill life up to 20 times with Lawson Company Flame-Plated tips. Less "puckering" delivers better quality; fewer stops for sharpening bring savings which outweigh the extra cost of Flame-Plating many times over.

RUBBER SKIVING KNIVES

Before Flame-Plating, skiving knives used in the rubber industry had to be sharpened after every shift. Since adoption of Flame-Plating the service life of this tool has been increased 15 times. A sharp edge is always present, due to a *self-sharpening* effect.

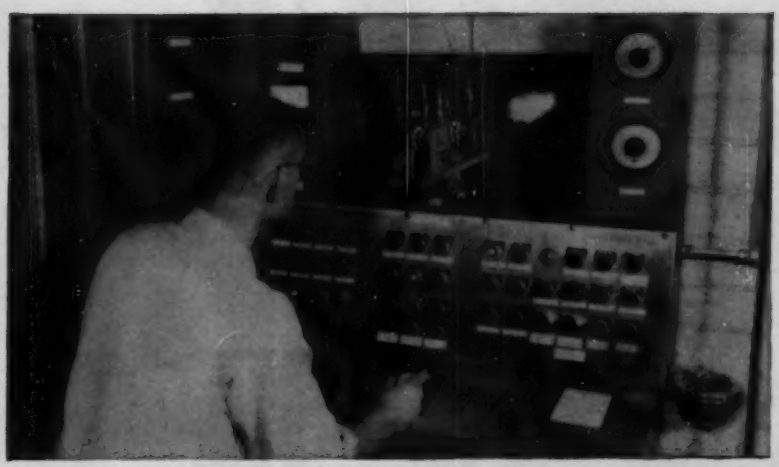


SEAMING CHUCKS

LINDE's Flame-Plating is an important time-and-money-saver for the abrasive-resistant, tolerance-stable seaming chucks used by major canners. Operating life is more than 4 times longer. Chucks, when worn, can be salvaged, replated, and returned to use.

for Metal Parts – Metal-Coated by

PLATING



THE "LINDE" FLAME-PLATING GUN—and how it works

In LINDE's revolutionary Flame-Plating process, precise quantities of oxygen, acetylene, and tungsten carbide powder—representing "powder and shot"—are fed into the gun by a special mechanism. The gun is aimed at the areas to be coated, then fired by remote control. Precision-controlled rapid-firing (4 per second) builds up the coating to the desired thickness. The as-coated smoothness of 125 microinches rms can be finished down to better than 1 microinch rms finish.

TYPICAL FLAME-PLATING APPLICATIONS

BEARINGS – sleeve, roller, gas
BLADES – aircraft turbine; doctor blades for papermaking
BLOCKS – anvil
BUSHINGS – ball piston pump
CHUCKS – seaming
CUTLERY – household
CUTTING, INDUSTRIAL – rubber, plastic, skiving knives, foods, paper, slitter knives, chipper knives, discontinuous chip-abrasive materials
DIES, TOOLING – cold-forming; coring punches, core rods, sizing punches, capstans
DOGS – sewing machine feed; gripping dogs
DRILLS – paper, acoustical tile, twist
GAGES – plug, ring, air
GUIDES – wire, textile, machine
HYDRAULICS – pistons, liners, valve plates, wobble plates, metering valves, servo valves, slippers
MANDRELS – wire-forming
PARTS – sintered
PISTON RINGS
PLATES – valve, wear
SEALS – turbine engine, pump
SURGICAL – needle holders and shears
VALVES – aircraft

PHYSICAL DATA—FLAME-PLATED COATINGS

COATING DESIGNATION	LW-1	LW-1N	LW-8	LE-1A	LA-2
Approx. Composition by weight	Tungsten Carbide +6% to 8% Co	Tungsten Carbide +13% to 16% Co	25% WC +7% Ni + mixed W-Cr Carbides	85% Cr_3C_2 + 15% Ni-Cr	99% +Al_2O_3 (gamma)
Hardness Vicker's (VPN_{300})	1200 to 1450	1050 to 1150 VPN 70 to 71 R.	1000 to 1200 VPN	850 VPN	1000 to 1200 VPN
Maximum temp. in oxidizing atmosphere	1000°F.	1000°F.	1400°F.	1800°F.	1200°F. to 1800°F.
Coefficient of thermal expansion	4.0 x 10 ⁻⁶/°F. Avg. 70 to 1000°F.	4.7 x 10 ⁻⁶/°F. Avg. 70 to 1000°F.	4.8 x 10 ⁻⁶/°F. Avg. 70 to 1400°F.	6.4 x 10 ⁻⁶/°F. Avg. 70 to 1800°F.	3.9 x 10 ⁻⁶/°F. Avg. 70 to 1832°F.
Modulus of Rupture	67,000 psi	80,000 to 106,000 psi	40,000 psi	75,000 psi	22,000 psi
Modulus of Elasticity	44 x 10⁶ psi	42 to 40 x 10⁶ psi	17 x 10⁶ psi	22 x 10⁶ psi	16 x 10⁶ psi
Porosity	0.5%	0.5 to 1.0%	0.5%	0.5%	1.0%
Specific Gravity	14.2	13.2	10.1	6.54	3.45
Specific Heat	0.048	0.056	0.070	0.127	0.196
Thermal Conductivity	5.3 at 500°F.	5.3 at 500°F.	3.8 at 500°F.	4.3 at 500°F.	0.86 at 500°F.
Main features	Extreme wear resistance	Excellent wear resistance + increased resist. to mechanical and thermal shock.	Excellent wear resist. to higher temps. Improved corrosion resist.	Good wear resist. at high temp. or in corrosive media. Resists flame impingement.	Excellent resist. to wear, chem. attack and high temperature deterioration.

AM 822

Linde Company, Flame-Plating
270 Park Avenue
New York 17, New York

I am interested in Flame-Plating for the following application(s):

_____

_____

_____

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE___ STATE____

LINDE COMPANY
Division of Union Carbide Corporation

UNION CARBIDE

LINDE and UNION CARBIDE are trade-marks of Union Carbide Corporation.

CIRCLE 954 READER SERVICE CARD

AN INSPECTOR CHECKS A "BOTTOMING" TAP for accuracy of the rake of the cutting face. Rex High Speed Steels help tapmakers produce the clean, accurate cutting edges so vitally needed in today's taps.

TODAY'S TRUE-RUNNING TAPS "TIGHTEN-UP" TOLERANCES

They produce more accurate threads—for closer fits

—because of continually-improved Rex® High Speed Steels

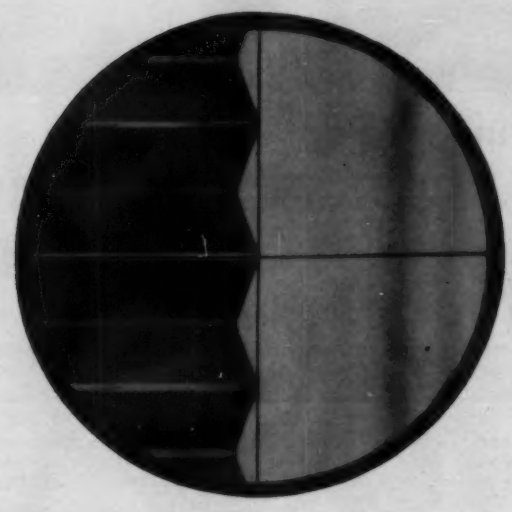
The ground-thread taps you now use produce more accurate threads—*and last longer*—even when tapping tough abrasive materials or today's high-strength alloys.

There's a story behind this development of more accurate and productive taps. It's the story of the tapmakers' continuing research and increasing skill—combined with Crucible progress in making better high speed steels.

To produce the fine steels needed for taps, Crucible tool steel specialists now use the most advanced electronic instrumentation available. For example: they can record the temperature of the molten metal in the melting furnace within 5 seconds. So, each heat is produced under identical temperature conditions.

Crucible specialists employ new techniques that also greatly improve deoxidation of the liquid steel. They use new ingot mold designs to minimize segregation. And they ultrasonically inspect every billet of Rex High Speed Steel before rolling or forging to ensure freedom from internal voids, flake, inclusions, etc.

For complete information on how Rex High Speed Steels can help make precision tools better, call or write Crucible branch office or service center near you.



THE RAKE ANGLE of a ¾-10 H5 "bottoming" tap looks like this — when viewed through the rake measuring instrument shown at left.

BETTER TOOLS, THROUGH BETTER STEELS. The constant improvement of Rex High Speed Steels ensures the increasingly better performance of hobs, broaches, twist drills, cutters and taps.

CRUCIBLE STEEL COMPANY OF AMERICA

Branch Offices and Warehouses: Atlanta • Baltimore • Boston • Buffalo • Caldwell, New Jersey • Charlotte Chicago • Cincinnati • Cleveland • Columbus • Dallas • Dayton • Denver • Detroit • Erie, Pennsylvania • Grand Rapids • Houston • Indianapolis Los Angeles • Miami • Milwaukee • Minneapolis • New Haven • New York • Philadelphia • Pittsburgh • Portland, Oregon • Providence Rockford • Salt Lake City • San Francisco • Seattle • Springfield, Massachusetts • St. Louis • East Syracuse • Tampa • Toledo • Tulsa

Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

ACCO for Better Values

With this Campbell Machine, you can--

Cut 6-inch Diameter Hard Alloys-Cleanly and Accurately-in Less Than 3 Minutes!

• This Campbell wet abrasive cutting machine—the Model 406—will cut tubing, bar stock, angle iron, or any other shape up to 6″ round or square—and it will cut practically *any* material, including the new super alloys and exotic metals. Like all Campbell machines, it's designed to give *accurate* cuts, quickly and cleanly.

HIGH SPEED—4 to 8 seconds per square inch is the normal cutting speed for all Campbell wet abrasive cutting machines. For instance, you can cut 6″ diameter hardened steel in less than 3 minutes.

ACCURACY—Campbell machines are production machine tools. They cut within close tolerances to reduce rejects and scrap loss. For example, the Model 406 will cut 3″ diameter material to lengths within ±.010″, 6″ diameter within ±.030″.

FINE FINISH—Additional finishing operations are rarely required. There is no burn, and burr has been reduced to an absolute minimum.

POWER OSCILLATION—On an oscillating-type machine such as the Model 406, the cutting wheel is moved horizontally back and forth *across* the cut as the wheel is fed downward. The result—greater cutting capacity, with longer wheel life.

PROPER COOLANT APPLICATION—Large reservoir and a 33 gallon/minute pump provide high volume of coolant. Unique Campbell distributor applies coolant equally to both sides of the wheel—an essential requirement for accurate cuts.

OTHER CAMPBELL MACHINES FOR ANY CUT-OFF NEED

Choose from four types of Campbell machines for wet or dry cutting—chop stroke, oscillating, horizontal or rotary—with capacities up to 14″ rounds, 12″ billets, plate up to 6″ thick and 20 ft. long.

Regardless of your application, you'll find that a Campbell machine provides you with the best cut-off method for modern production techniques—far more efficient, accurate and economical for cutting many materials than other cutting equipment.

WRITE FOR DETAILS—Bulletin DH-260 gives the complete story on the Campbell Model 406 abrasive cutting machine. We'll also be glad to send you information on other machines; just tell us your cut-off application. And remember—your Allison-Campbell Field Engineer is an abrasive cutting specialist. Call on him for expert advice.

ACCO

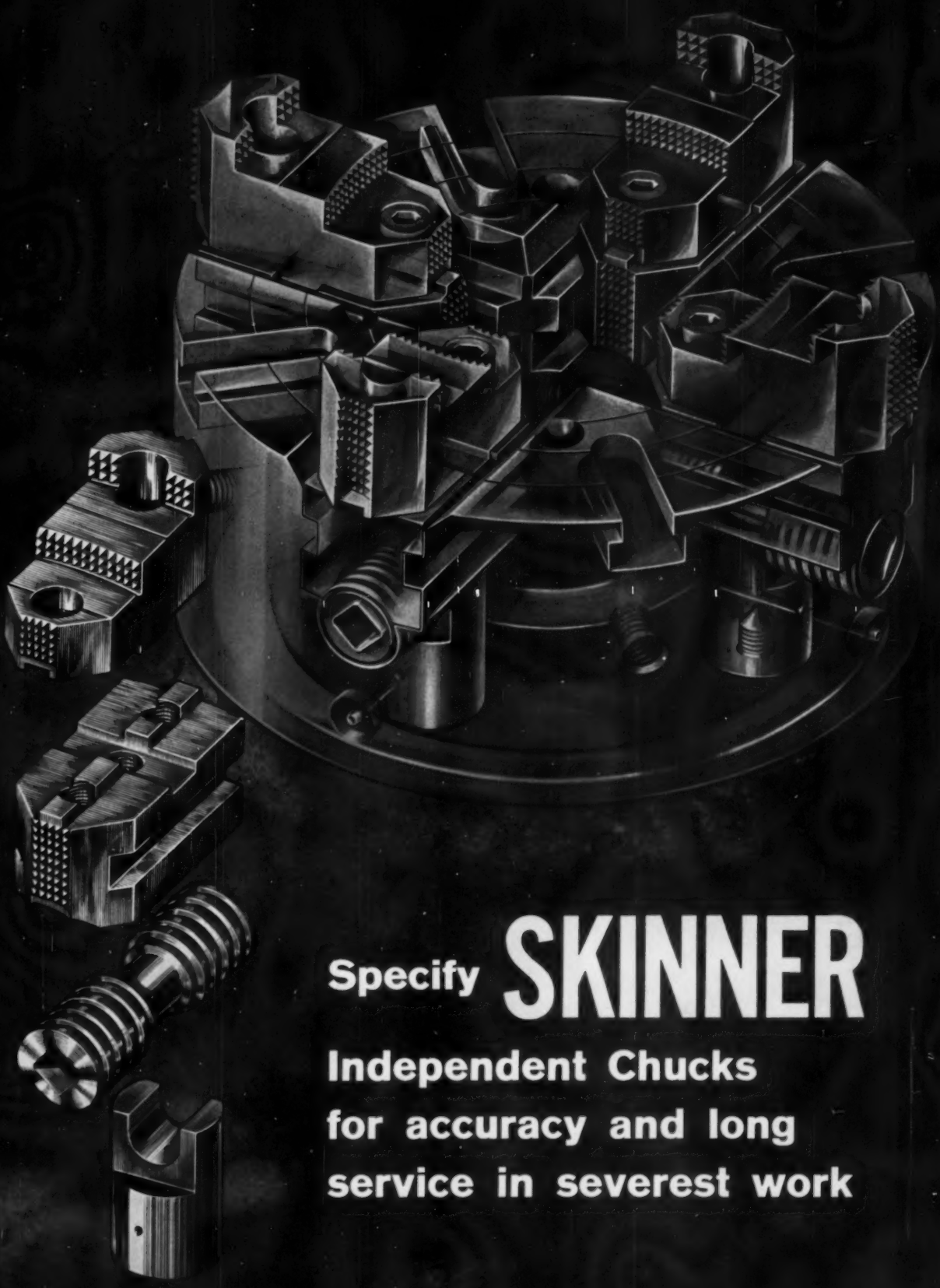
CAMPBELL ABRASIVE CUTTING MACHINES

Allison-Campbell Division • American Chain & Cable Company, Inc.

923 Connecticut Avenue, Bridgeport 2, Conn.

CIRCLE 956 READER SERVICE CARD

CIRCLE 957 READER SERVICE CARD ►



Specify **SKINNER**

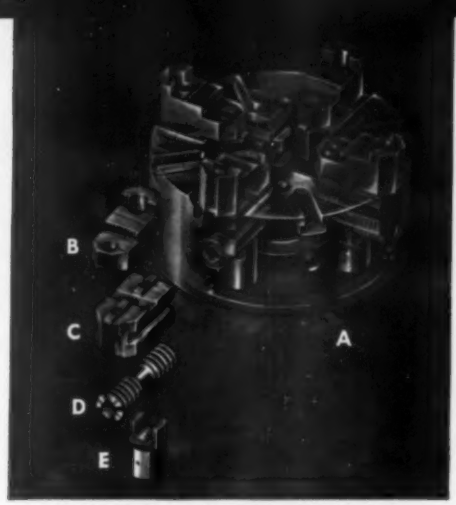
Independent Chucks for accuracy and long service in severest work

FORGED STEEL BODY withstands extreme jaw pressures developed on modern production lathes.

Large Diameter Operating Screws permit long range of jaw adjustment and assure precision control of jaw movement.

Hardened Steel Solid Thrust Bearings absorb end thrust on flat parallel faces and are rigidly fitted to the chuck body.

Accurately Ground, Hardened Jaws available in two-piece construction shown here, master jaw with reversible hard stepped top jaw—or one-piece solid hard stepped reversible jaw.



A—Transparent view of heavy-duty independent chuck
B—Hard, stepped reversible top jaw C—Master jaw
D—Operating screw E—Solid thrust bearing

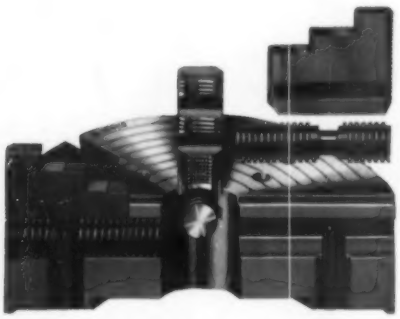
Superior Skinner design assures superior independent chuck performance

Skinner design achieves top chuck performance by combining separate parts of one chuck so that every part functions perfectly and in maximum support of other parts. See how the forged steel body surrounds more than 60% of the operating screw *for the full length of the screw*. Note the carefully machined jaw slots with heavy ribs to guide jaw movement and help hold jaw and screw in proper alignment at all times. See how the precision square threads of jaw and operating screw contribute further to even distribution of the strains set up by heavy gripping pressures. Every part is carefully made to exacting standards, and the whole chuck is *designed* to provide maximum gripping and accuracy.

Skinner heavy-duty independent chucks are designed for the rugged service required on modern turret lathes and have additional features such as:

- Wider jaws
- Larger and heavier operating screws
- T slots
- Specially designed bearings

An additional feature is the design of the master jaws below the face of the chuck, so that when top jaws are removed the chuck can be used as a face plate for clamping work.



Side view showing precise fit of operating screw, thrust bearing and jaw in medium duty chuck (solid jaws shown)

End view showing how chuck body surrounds 60% of screw circumference

General Information and Features	
Types and Sizes	Heavy-duty—12″ to 28″ Medium-duty—4″ to 36″ Light-duty—6″
Mounting	Skinner independent chucks are available for direct mounting on American Standard Spindles and for mounting on threaded spindle noses by means of separate adaptor plates.
Soft Blank Top Jaws	Standard height, extra high and long pointed sizes are available for heavy and medium duty chucks. Can be supplied or shaped to meet specific requirements.

Skinner manufactures a complete line of self-centering and combination scroll chucks, self-centering geared screw chucks, power chucks and accessories, packaged power chucking assemblies, and vises for milling, drilling and general machine work.

For complete details on Skinner Chucks and up-to-date information on major chuck developments, contact your Skinner representative or distributor, or write to us.

SKINNER CHUCKS®

THE CREST OF QUALITY

SKINNERCHUCKS

THE SKINNER CHUCK COMPANY • NEW BRITAIN, CONNECTICUT, U.S.A.

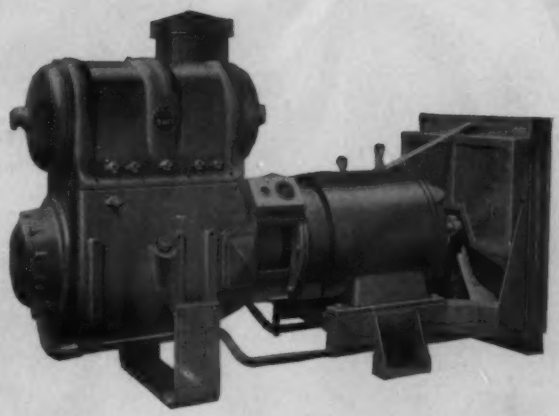
PRINTED IN U.S.A.

Only DAVEY offers both water-cooled and air-cooled rotary compressors of equal efficiency and long service life

HYDROVANE DAVEY

water-cooled

air-cooled



See 46 Davey Compressors in operation at Machine Tool Exposition

With Davey you can meet every compressor need—perfectly! For Davey gives you your choice of a complete line of both water-cooled and *air-cooled* Hydrovane Rotary units. These are equally efficient, economical to operate . . . built for long, trouble-free service.

This means you can now use air-cooled compressors in locations where water is not available or water cost savings are highly essential.

IMPORTANT: Oil consumption of Davey Hydrovanes is only a fraction (often less than 10%) of that of other rotary compressors. In fact, Davey Hydrovanes use no more oil than ordinary reciprocating units. *Also, only Davey offers long-life Perma-Vane* blades.* These eliminate blade deterioration and breakage—biggest source of rotary compressor trouble.

See your local Davey distributor today! Or, write for Bulletin E. A-2941A

*U.S. Patent No. 2,905,376

DAVEY pioneers of "air-cooled air"

Industrial Division

DAVEY COMPRESSOR CO.

Kent, Ohio

Distributors in All Principal Cities

*Trademark

"No more lugging work half a mile to the inspection room—and hefting it back again when it's a little over tolerance— probably cost the company a fortune for all that lost time too.

This gage you can use right at the machine without taking the work off—and check the surface finish right down to a whisker.

They cost little enough to have one at every machine where we do this kind of work.

Is it good? Just look at the specs!"

- 5 Range selections for any precision roughness measurement: 3, 10, 30, 100 and 300 microinches—full scale.
- Roughness width cut-off available in three ranges: .003, .010 and .030.
- Quickly establishes the requirements for each job and allows faster, closer control of the operation.
- Hand held or motor driven tracer.
- Battery or AC line powered units available.

Contact your nearest Cutler-Hammer office for the name of your authorized distributor.

AIRBORNE INSTRUMENTS LABORATORY
DEER PARK, LONG ISLAND, NEW YORK
A DIVISION OF CUTLER-HAMMER INC.

CONTROL

New

FOR THE FIRST TIME... A PRACTICAL INEXPENSIVE TAPPING ATTACHMENT FOR USE ON ANY DRILL PRESS

THE SUPREME VersaTAPPER . . .

0—½" Tapping Head

for $63

- COMPLETE WITH TAP CHUCK
- BALL BEARING SPINDLE
- RUNS IN OIL
- MINIMUM TAP BREAKAGE

ON-AND-OFF A DRILL PRESS IN SECONDS!

Install it in 20 seconds

Capacity 0 to ½"

Yoke of VersaTAPPER is adjusted to reach to drill press column. Adjustment need not be repeated unless tool is used on a different model drill press.

Entire unit is chucked to the drill press chuck. Alternate model has No. 2 Morse Taper Arbor for direct installation to drill press spindle.

A Supreme Accutap Tap Chuck is standard equipment, and with its extension set, handles all taps from 0 to ½". Accutap is highly recommended for its accuracy.

Here's the Tapping attachment for drill presses that does everything! Taps in any material, at any size up to one-half inch, and does it easily, efficiently, economically. Arrange a test in your plant soon—you'll be glad you did. Two models to choose from: *Model 6100*, with straight shank. (see photo). *Model 6200*, with No. 2 Morse Taper Arbor. Each model just *sixty-three dollars*, complete.

Supreme VersaTAPPER

DRILL PRESS TAPPING ATTACHMENT

SEE VersaTAPPER IN ACTION . . .

Production Engineering Show . . . Navy Pier, Chicago . . . Booth 226. And in your own shop by arrangement with any Supreme Distributor.

For fast, intelligent, local service, order from your industrial supply distributor.

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

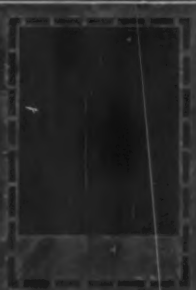
GUARANTEED BY THE MAKERS OF **SUPREME BRAND CHUCKS**

SUPREME PRODUCTS CORPORATION

2222 S. Calumet Ave.
Chicago 16, Illinois

DIVISION OF A-S-R PRODUCTS CORPORATION

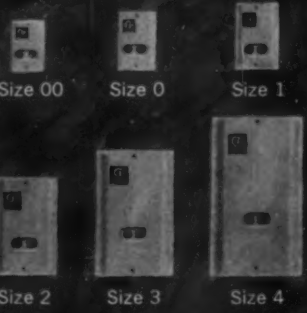
CIRCLE 960 READER SERVICE CARD



Smaller! About 20% smaller than Size 0 Starters. Just 5 3/4" wide, 7" high and 4 3/16" deep.

Convertible! Carried in stock with three cover options or easily converted in field from "reset" only to "start and stop-reset" or "three-position selector switch." Kits at optional cost.

Broad line!



CONTROL

A new addition to the famous three star line

New! Save space and money with Cutler-Hammer's Size 00 A-C Magnetic Starter

Takes up to 20% less space... costs 18% less than Size 0 Starters. Now you get two big new bonuses in control selection . . . less space and less money Both with the all new Size 00 Starter.

Before, you had to use a larger starter in applications where it really wasn't needed. But, now you can use the Size 00 in about 40% of the applications where the Size 0 is usually used.

The new Cutler-Hammer Size 00 Starter performs to the same high standards you get from all Cutler-Hammer Starters. And, you still get vertical, dust-free contacts which add so much to more reliable starter performance. Your choice too, of 2-coil or 3-coil overload protection in the same small enclosure.

The Bulletin 9586 Size 00 Starter can be used on any general application. Its maximum horsepower ratings: Three phase: 208/220 volts, 1½ hp. 440/550 volts, 2 hp. Single phase: 115 volts, ½ hp. 230 volts, 1 hp. It's available open or in NEMA 1 enclosure. Send for Pub. LO-40-Q239.

Why you get more from Cutler-Hammer. New things are happening at Cutler-Hammer—new, better products, new engineering ideas and talent, new plant capacity. We're on the move. And, we'd like to show you how we could help you in any electrical control problem. Contact the nearest Cutler-Hammer distributor.

WHAT'S NEW? ASK...

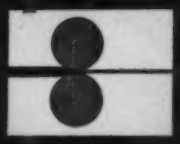
CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler Hammer International, C. A. Associates: Canadian Cutler-Hammer, Ltd.: Cutler-Hammer Mexicana, S. A

CONTROL

COLD HEADING MACHINERY

Cold Headers • Parts Formers • Nut Formers • Slotters • Threaders • Pointers • Trimmers and other Cold and Hot Forming Equipment



ROLLING MILL MACHINERY

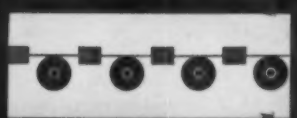
Two-High and Four-High Mills • Special Mills • Sendzimir Mills • Rod Mills • Slitters • Coilers • Winders • Straighteners • Payoffs • Edgers • Coil Boxes • And Other Mill Equipment

WATERBURY FARREL

MACHINERY BUILDERS

WIRE MILL EQUIPMENT

Continuous Tandem And Upright Cone Wire Drawing Machines • Bull Blocks • Wire Flattening Mills •



Swagers • Roll Pointing Machines • Spoolers • And Other Wire Equipment

POWER PRESSES

Cam and Crank Eyelet Machines • Horizontal Redraw Presses • Multiple Plunger Pillar Presses • High Speed Blanking Presses • Collapsible Tube Equipment • Ammunition Machinery, etc.

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
DIVISION OF TEXTRON INC.
Waterbury, Connecticut • U.S.A.
Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.

WF 51R

Modular Profiling...Pattern for Assured Accuracy

Progressive manufacturing methods . . . like *modular profiling* . . . are among the means which enable National Tool Company to pass on the benefits of assured accuracy and faster service to its customers.

By constant improvement of techniques such as this, better products result . . . to meet the increasingly exacting demands of the metalworking industry . . . to provide quality and performance *dependability*.

NATIONAL Tools CLEVELAND

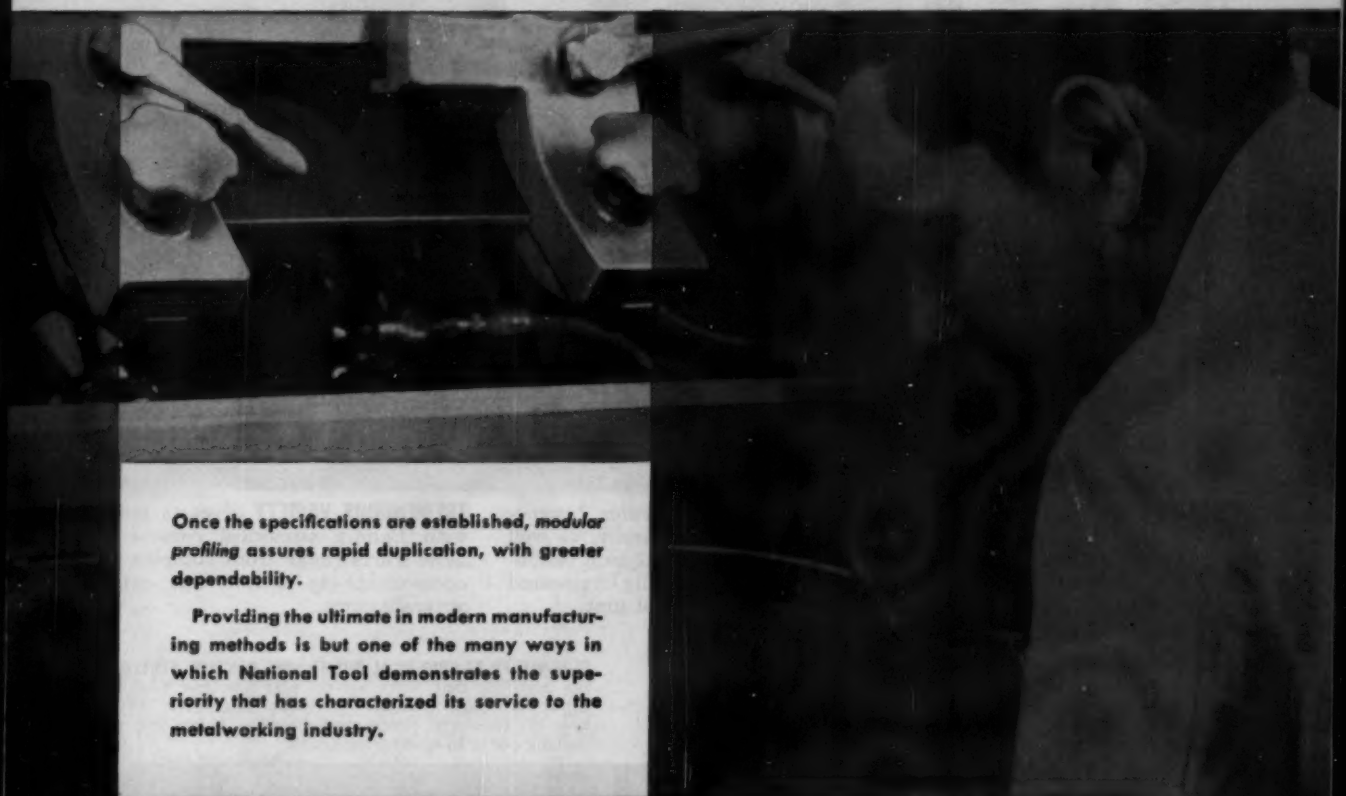
NATIONAL TOOL COMPANY

A DIVISION OF

National Cleveland Corporation, 11200 Madison Avenue, Cleveland, Ohio

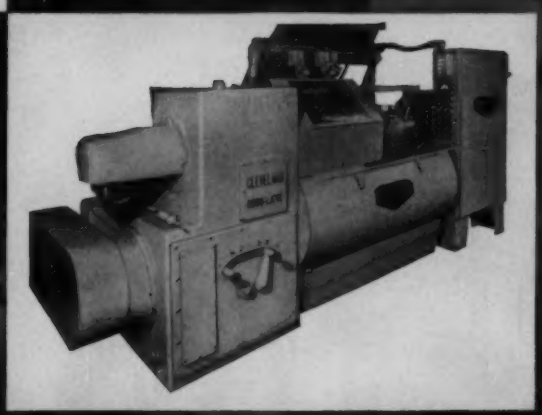
For more than a half century National Tool has supplied high quality precision cutting tools to the metalworking industry.

For your special cutting tool requirements call your National Tool representative.

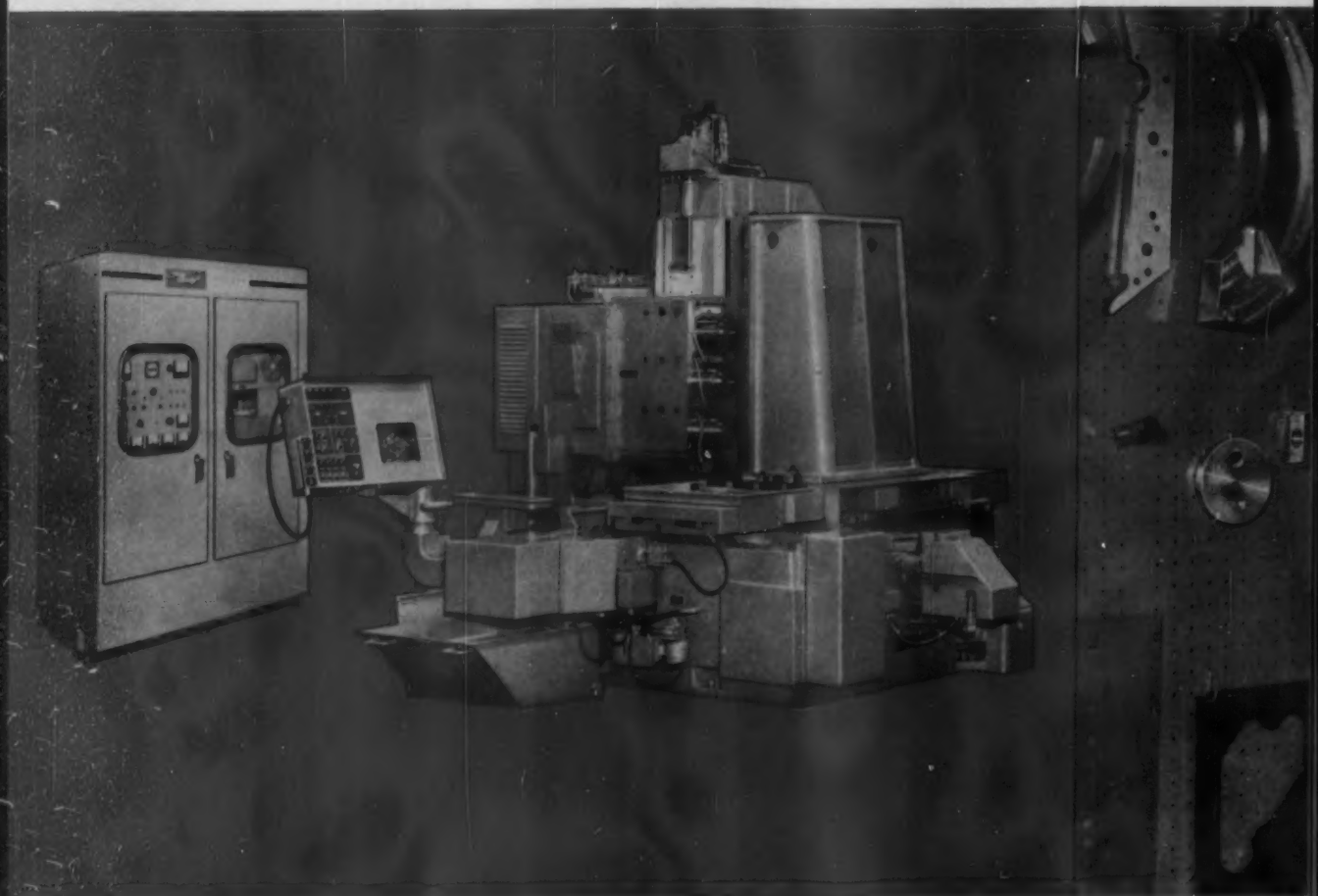


Once the specifications are established, *modular profiling* assures rapid duplication, with greater dependability.

Providing the ultimate in modern manufacturing methods is but one of the many ways in which National Tool demonstrates the superiority that has characterized its service to the metalworking industry.



NOW—BENDIX OFFERS COMPLETE LINE

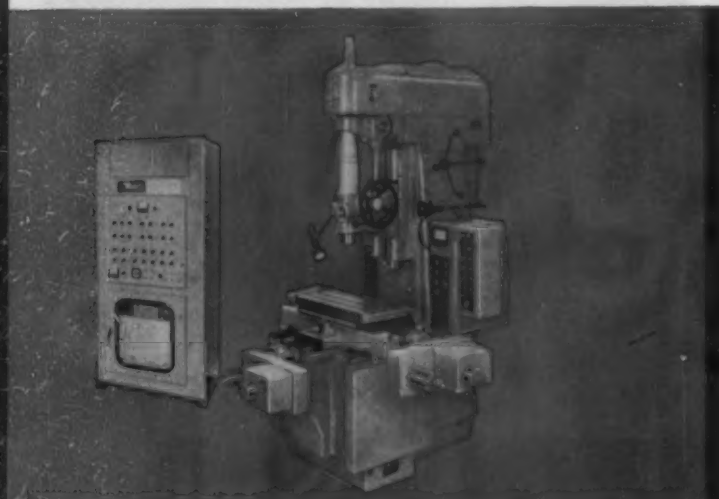


DYNAPATH-23 NUMERICAL CONTOURING CONTROL. Featuring *Circular Interpolation* to permit the close-tolerance machining of arcs and circles, as well as straight lines, with a minimum of input data. Offers 0.0002-inch resolution on 2, 3, or more axes of control. Each application individually engineered for the best possible combination of machine tool and control unit.

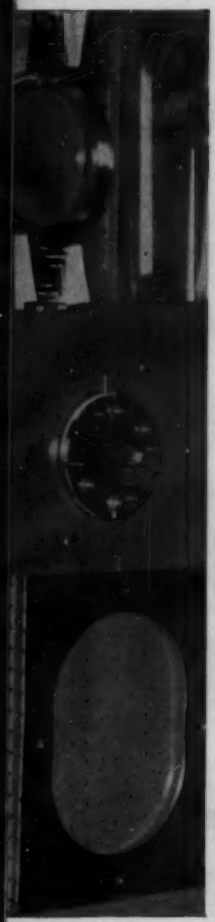
TREMENDOUS VARIETY of parts machined with Bendix numerical control shown here. Parts range from complex missile components to simple but extremely accurate cams.

DYNAPOINT-22 NUMERICAL POSITIONING CONTROL. Provides the finest electronic resolution available anywhere—0.000010″ for jig borer accuracies within 0.0001″ on finished parts. Uses 8-channel binary-coded decimal tape format—compatible with other N. C. units and with standard tape preparation equipment.

FERRANTI FP-22 NUMERICAL POSITIONING CONTROL SYSTEM. Floating zero for fast, easy set-up and low-cost tooling. Dial input provides manual operation flexibility. Wear and loss of accuracy eliminated because there are no contacting parts in measuring units.



OF NUMERICAL CONTROLS



New, completely transistorized POSITIONING and CONTOURING units provide greater reliability, lower operating costs and made-to-order accuracy.

Tested and proven in scores of installations, over thousands of productive hours, Bendix numerically controlled contouring systems have become recognized as the finest. Based on this solid history of achievement, The Bendix Corporation now introduces its second generation control systems, the DynaPath-20 Series Numerical Contouring Controls, and the DynaPoint-20 Series Numerical Positioning Controls.

To further extend its broad coverage of the numerical control field, Bendix has obtained exclusive rights to distribute the Ferranti tape controlled positioning units and Ferranti's unique coordinate measuring machine.

Bendix backs up the most complete line of numerical control equipment with the best and most complete service organization in this country. From application engineering through tape preparation, customer training and field service, Bendix has had more teamwork experience than has any other electronic controls manufacturer in the field.

Only at Bendix can the machine tool builder and user find everything he needs for numerically controlled manufacturing. Why not investigate Bendix PACKAGED PRODUCTIVITY today.

FERRANTI FI-22 COORDINATE MEASURING MACHINE. Checks workpieces up to ten times faster than conventional methods. Direct and continuous readout (in ¼-inch figures) of hole center locations with one-set-up simplicity. Accuracy of ±0.001" over entire 15" x 24" range.

THE Bendix CORPORATION

Industrial Controls Section

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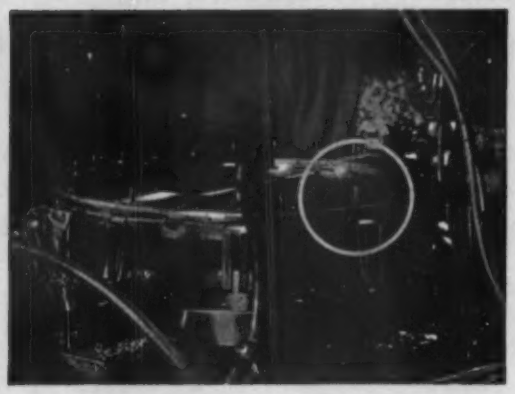
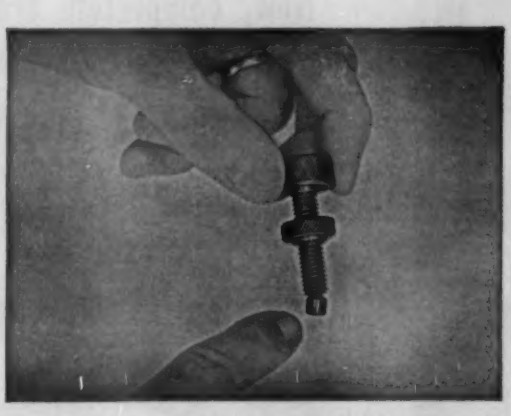
No. 3 of a series

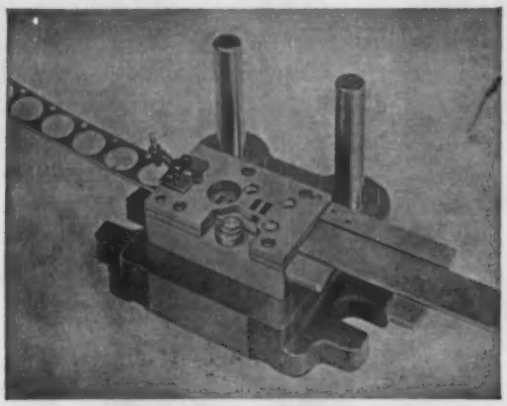
Are your tool makers wasting time making complicated tooling gadgets when a standard, off-the-shelf Vlier part could do the job much better? Why not examine your present drawings and see where these simple, low-cost parts can be used. You will be amazed at the savings possible.



PRODUCTION INCREASED 300% when this 12-station automatic indexing and tapping fixture was put to work. Vlier Spring Plungers allow the operator to load by simply pushing the part into a slot. These simple, spring-loaded tools also position the part for the tapping operation. Available in four models; fifty sizes.



NEW SWIVEL PAD-TORQUE THUMB SCREW combines the Vlier Torque Thumb Screw and Swivel Pad Clamp. The result is a perfect holding tool—one that applies only the right amount of holding pressure without damaging the finished surface. Unique ball joint construction of the pad permits adjustment to off-angle surfaces.



PROPER STOCK ALIGNMENT IN PROGRESSIVE DIES becomes a simple task with the new Vlier Stock Pusher. Saves pilots. Mounts in tapped hole. Accommodates stock as thin as .010"; width variations totalling 1/16". Nothing to wear out or foul up.

NEW 1958 CATALOG NOW AVAILABLE—Eight pages; completely revised. Includes information and specifications on all new Vlier products, including the Torque Handle, Stock Pusher, Leveling Pad. Makes ordering easy. Suggests new uses for these proven time-savers. Write for your copy today!

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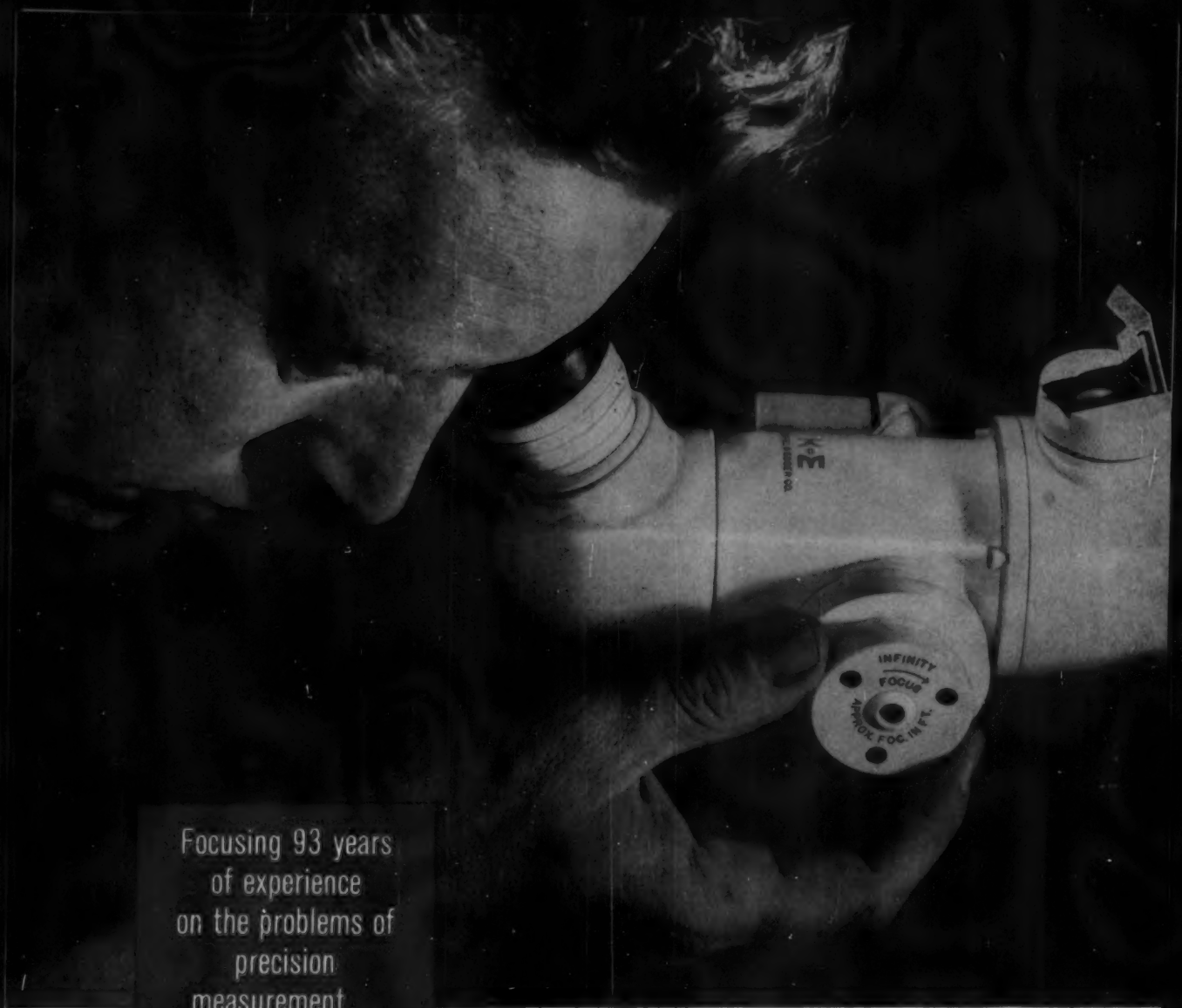

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You'll get a fresh slant on ways to work metal when you visit the Production Engineering Show in September. Stop by the STRIPPIT booth and see how our self-contained punching units eliminate expensive dies, how the Flex-O-Drill sharply reduces template making time, how our versatile Fabricators simplify pilot and production runs. SELF-CONTAINED HOLE PUNCHING UNITS reduce tooling to a simple assembly operation. Punches, stripping guides and die buttons are component parts of the unit. Nothing's attached to press ram. No die set required!

STRIPPIT FLEX-O-DRILL (left) speeds production of accurate templates and layouts. A table-top precision machine for drilling, reaming, center punching and scribing, Flex-O-Drill does away with need for base-line drawings or vernier height gauges. Handles ¼" material up to 24" wide and in any length. STRIPPIT MODEL 15A FABRICATOR (right), the latest model of one of industry's most versatile sheet metalworking machines, features the new Strippit Electro-Hydramatic Head for controlling the stroke. The time-saving Fabricator punches any sheet material up to ¼" thick, notches and nibbles up to ⅛" thick material.

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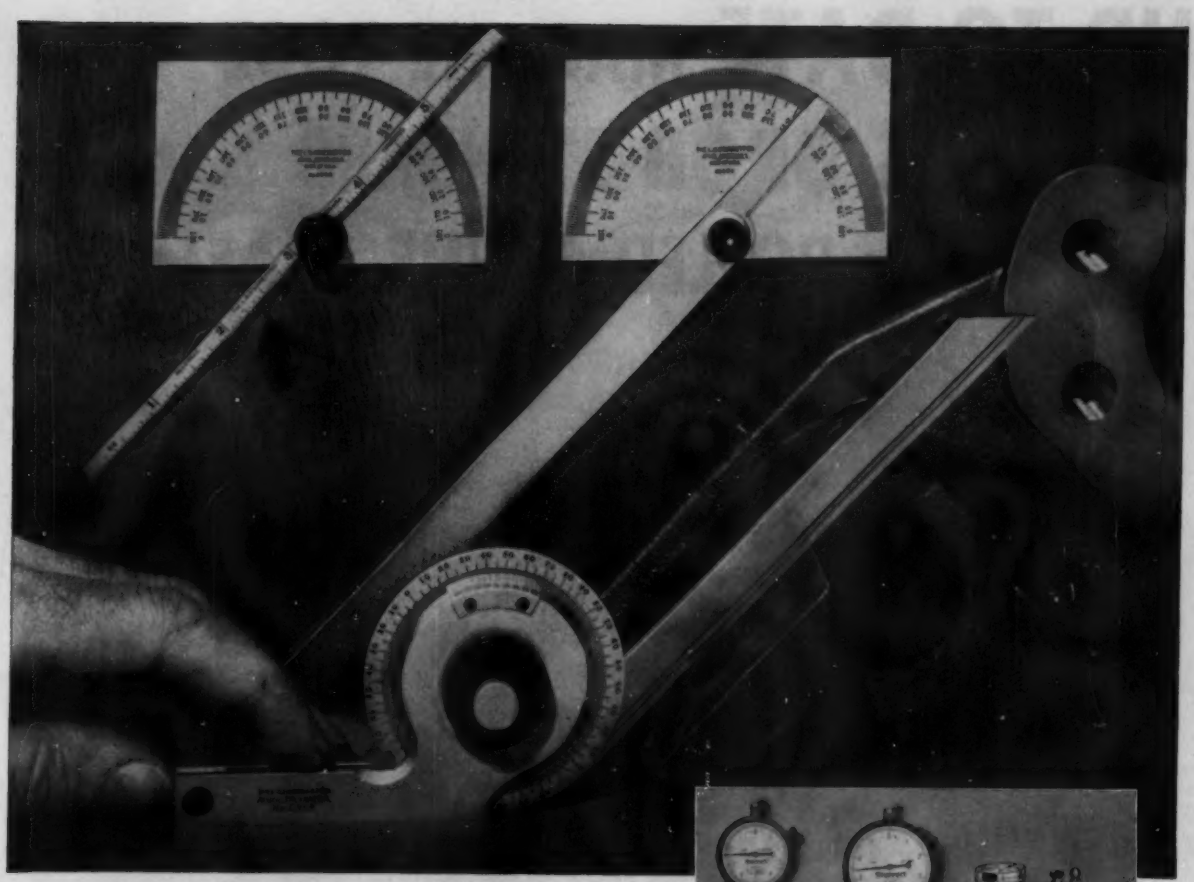
In Canada: Strippit Tool & Machine Company, Brampton, Ontario; In Continental Europe: Raskin, S. A., Lausanne, Switzerland; In the British Isles: E.H. Jones, (Machine Tools) Ltd., Hove, Sussex, England.



PRECISION MEASURING TOOLS — No. C359A Satin-Chrome Universal Bevel Protractor, No. C493B Satin-Chrome Protractor and Depth Gage • No. C183 Satin-Chrome Steel Protractor illustrated above.

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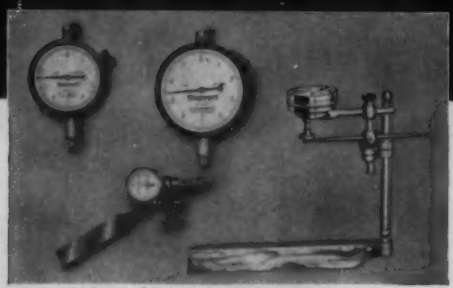
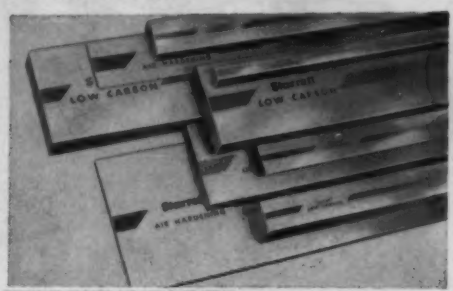


DIAL INDICATORS AND GAGES



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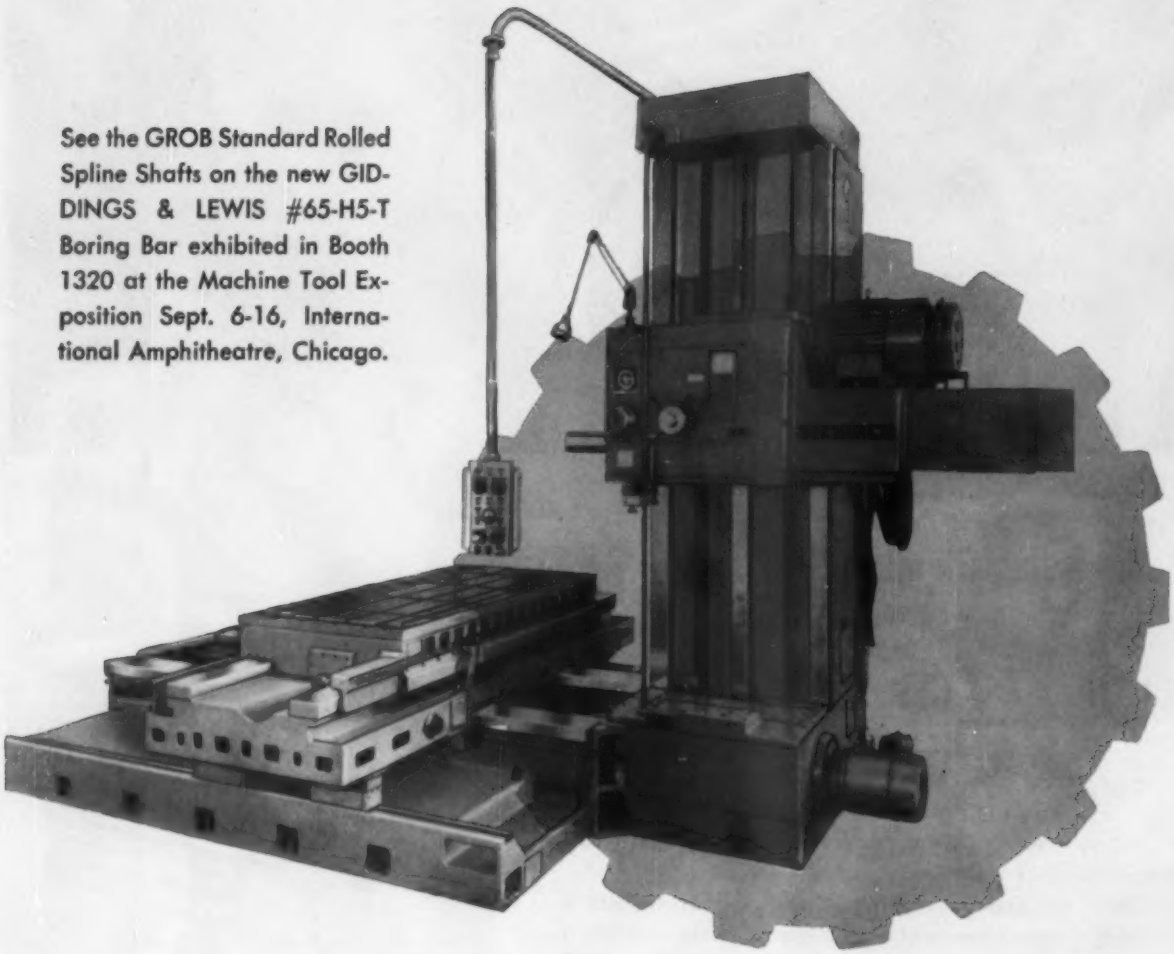
See the GROB Standard Rolled Spline Shafts on the new GIDDINGS & LEWIS #65-H5-T Boring Bar exhibited in Booth 1320 at the Machine Tool Exposition Sept. 6-16, International Amphitheatre, Chicago.



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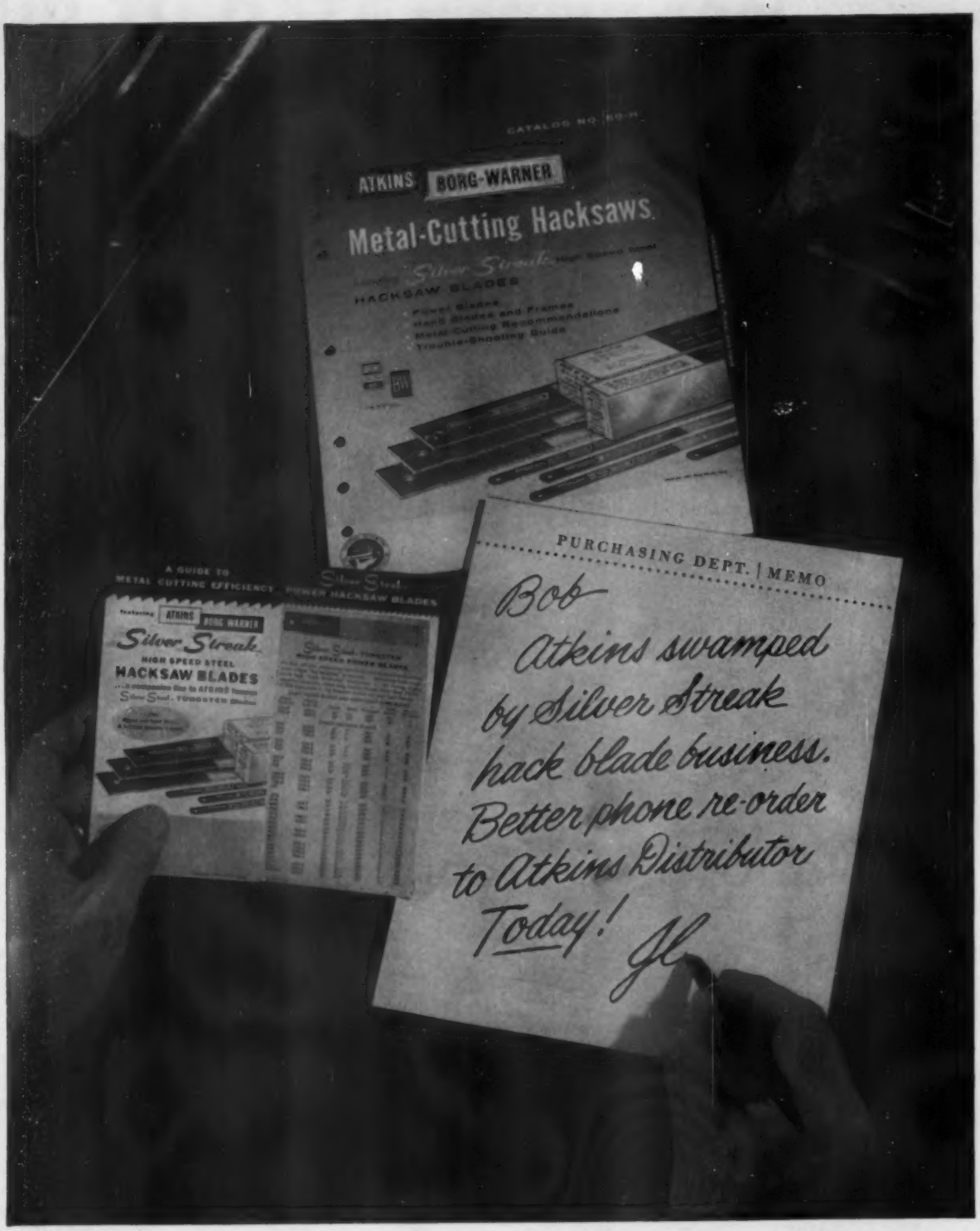

BE SURE TO VISIT ATKINS' BOOTH No. 326

1960 Production Engineering Show (Machine Tool Exposition)—Navy Pier, Chicago—September 6-16

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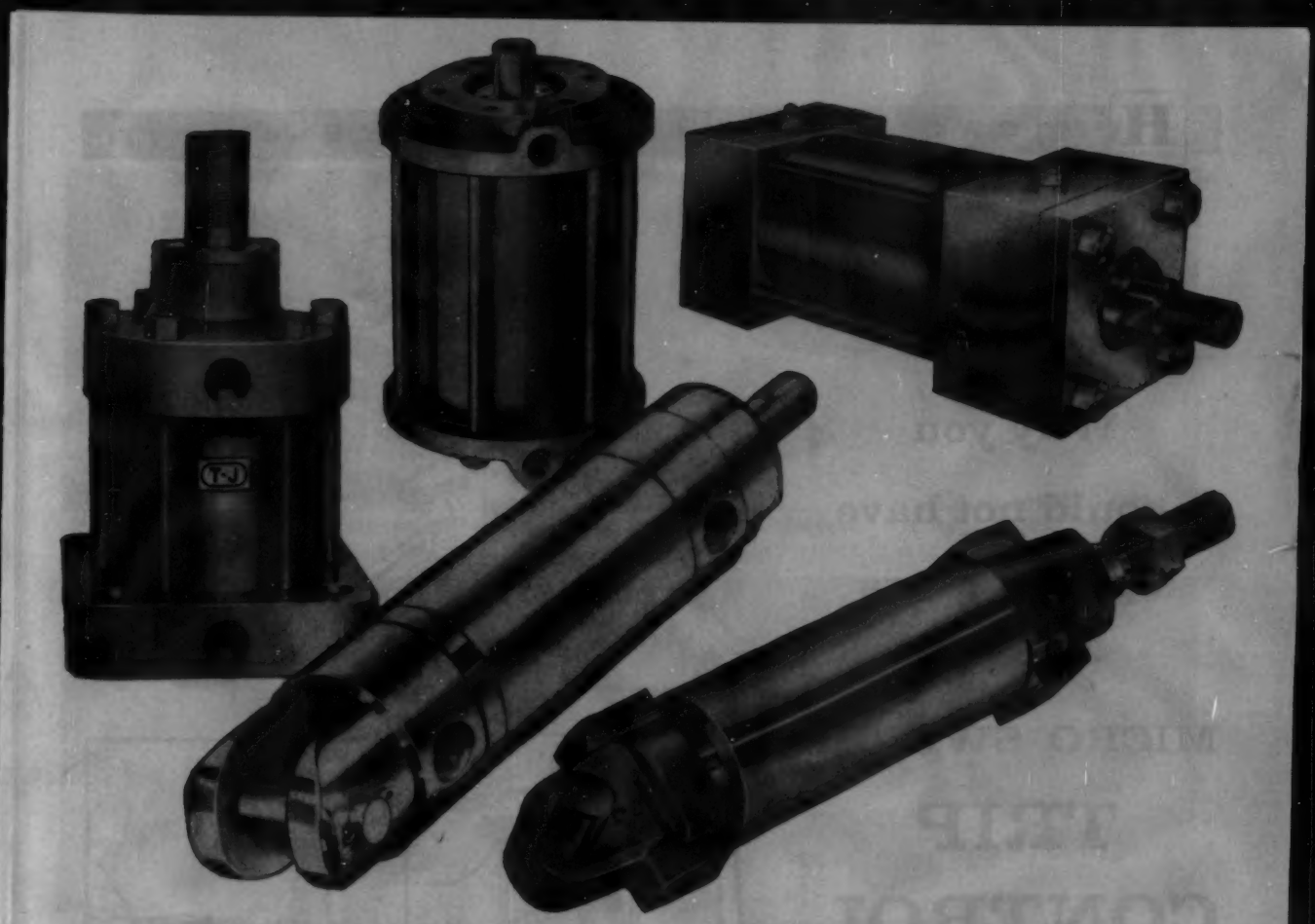

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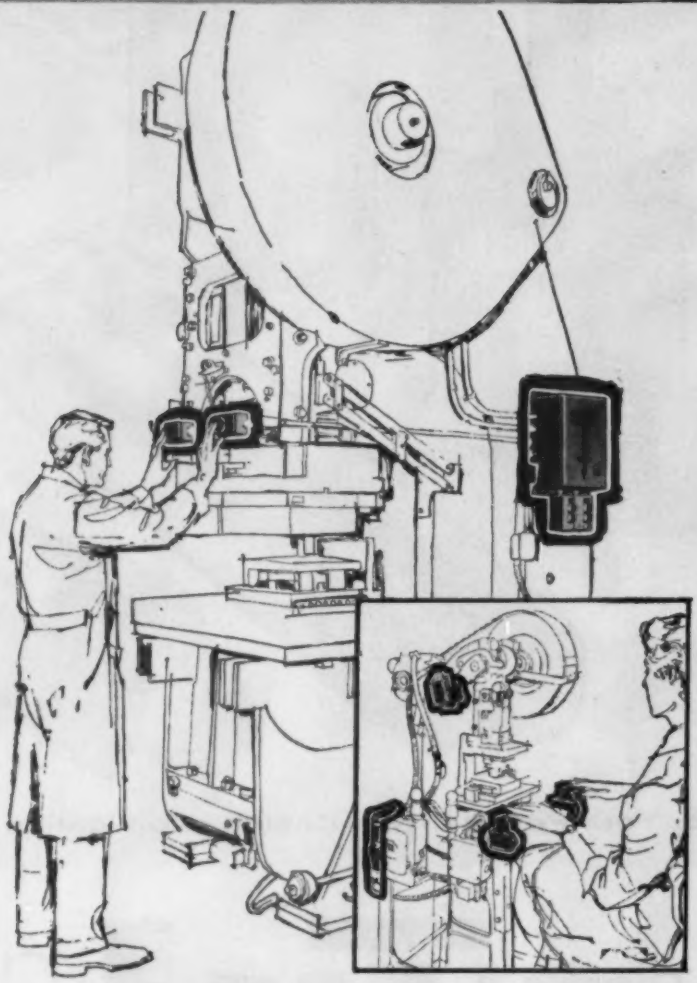
Why you should not have a punch press without MICRO SWITCH TRIP CONTROL



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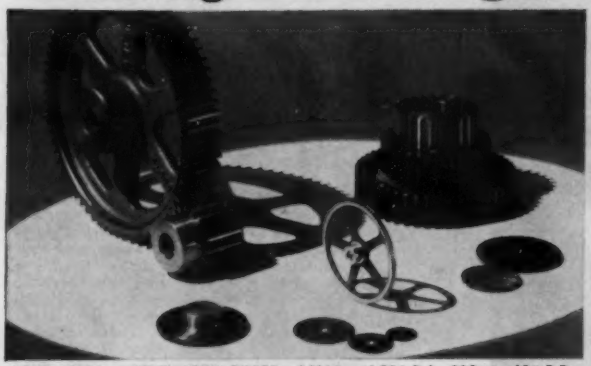
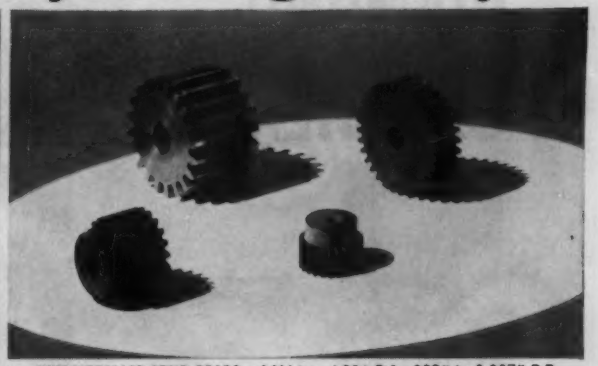


SPUR GEARS — STEEL, IRON, BRASS 14½° and 20° P.A. .208" to 40" P.D.



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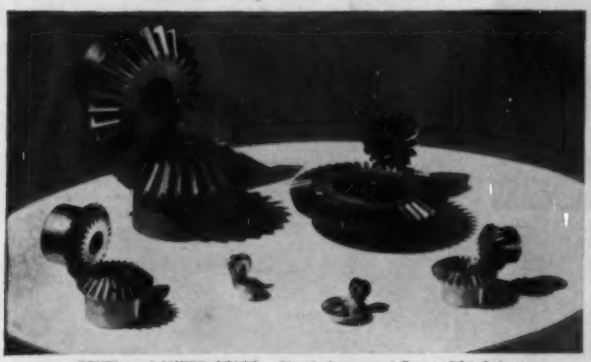
Stop in at Booth 123 — PRODUCTION ENGINEERING SHOW



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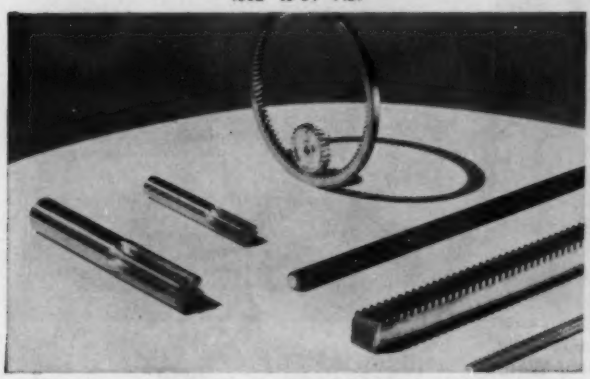
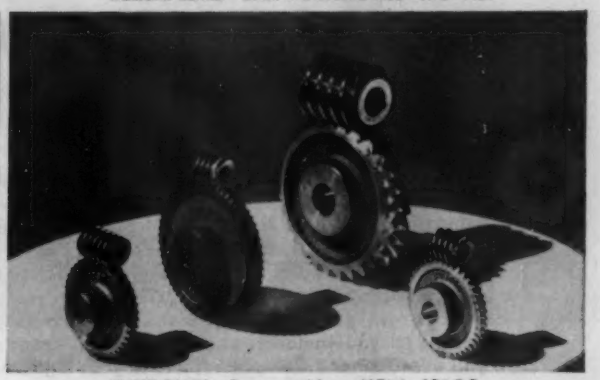


RACK • PINION WIRE Steel and Brass 14½° and 20° P.A.
PINIONS • INTERNAL GEARS



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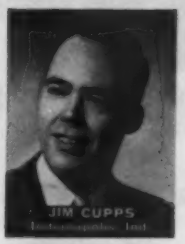

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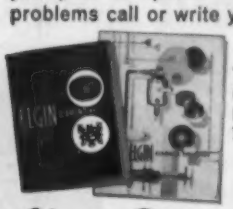

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Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 NUMERICALLY CONTROLLED POSITIONING EQUIPMENT — *Pratt & Whitney Co, Charter Oak Blvd, West Hartford 1, Conn.* 12-page bulletin 639 presents illustrated descriptions of point-to-point numerically controlled equipment. Included are machines providing the following types of numerical controls: tape control of a single axis on horizontal rotary tables and vertical rotary tables; tape control of two axes on jig borers in a complete range of sizes; tape control of three axes on jig borers with built-in rotary tables; and tape control of spindle on jig borers with automatic control of spindle speed, feed, and boring depth.

2 KELLER MACHINE — *Pratt & Whitney Co, Charter Oak Blvd, West Hartford 1, Conn.* 9-page circular 642 covers the Keller BL-3622 Model C with new electronic control incorporating transistorized logic circuits to provide extreme sensitivity and rapid machine response. Great improvement is reported achieved in high speed milling, heavy-duty cuts, and superior surface finishes. Model C is an automatic tracer-controlled milling machine capable of two-dimensional profiling and three dimensional full model reproduction as well as two dimensional profiling at variable depth.

3 PRODUCTION LATHE — *Pratt & Whitney Co, Charter Oak Blvd, West Hartford 1, Conn.* 4-page bulletin 641 covers the SIM T5 with 10-in. rated capacity. Machine has 9 forward and reverse speeds and 9 longitudinal and cross feeds. Spindle speed range is from 180 to 2800 rpm.

4 PRESSES AND PRESS BRAKES— *Verson Allsteel Press Co, 9300 S Kenwood Ave, Chicago 19, Ill.* 24-page condensed catalog 6-60 pictures and describes company's mechanical and hydraulic presses and press brakes, hydraulic shears, press and press brake tooling, and special machinery. Contains basic specifications for the most commonly used equipment.

5 SLITTING SHEARS AND FLANGERS—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY.* 12-page bulletin 70-G pictures and describes complete line of redesigned, power-operated units for medium and

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The prettiest tool-maker at Pratt & Whitney

She probably wouldn't know a micrometer from a hairpin, but using that Friden Flexowriter®, she's preparing a numerical control program tape which helps speed production of tools that are faster, more reliable and far more accurate than ever before.

Today, Pratt & Whitney Company is building five different types of numerically controlled machine tools—*and using numerically controlled tools to do much of the work!*

Significantly, Pratt & Whitney now uses eight-channel punched paper tape control exclusively. After much experimentation, P&W, like so many others in the field, has chosen punched paper tape as the best all-around input medium. Reliable, dependable, easy-to-program—punched paper tape is fast becoming the one thing that most numerically controlled tools have in common.

THIS IS PRACTIMATION: The Friden Model NC-1 Flexowriter is a perfect example of what we call PractiMation—automation so hand-in-hand with practicality there can be no other word for it.

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Friden

SALES, SERVICE AND INSTRUCTION THROUGHOUT THE U. S. AND THE WORLD

"Get rid of that DUST!"

"The boss was sore and I was on the spot.

"He shoved the report from the efficiency engineer at me. I read it: 'Yearly loss due to machine wear, misalignment and down time . . . $3,000. Major cause . . . abrasive dust.'

"The boss pointed his finger at me, 'Get rid of that dust and get rid of it fast!' "

Now, it was my problem, and I was on the spot.

"First thing I did was to check into a central dust collecting system. But the lowest bid I could get was $8,000. Too much.

"Then I came across a Torit ad, offering economical portable dust collectors.

"Two days after my call Torit engineers showed me how in only one week they could install a portable, unitized Torit Dust Collector at each of our eight grinders, trapping dust right at its source—cleaning the air throughout the entire plant.

"Total cost? Only $2400.00. That's a $5,600.00 saving over the lowest priced central system.

"You guessed it—we installed the eight Torit Collectors."

Torit solved my problem

"This year when we received our report it read: 'Loss due to machine wear, misalignment and down time...$340.00.' A saving of $2,660.

"This time the boss was all smiles. He slapped me on the back, 'Charlie, you did a fine job getting rid of that dust. Frankly, I didn't think it could be done with such a small investment.'

"Now there's a pretty nice fellow to work for.

"If you've got a dust problem, or are about to have one, write the Torit people. They've manufactured and sold more dust collectors than anyone else in the U.S.A. Chances are they can help you the way they helped us."

TORIT manufacturing company

Dept. 422, 1133 Rankin St., St. Paul 16, Minn.

Free Literature

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heavy work. Included are ring and circle shears; circle shears; slitting shears; combination ring and circle shear and flanger; combination circle shear and flangers for light work and heavy work; and a ⅝-in. capacity flanger for extra heavy work. Data provided on factors governing height of flanges for various gage materials; specifications and accessories included.

6 SINGLE SPINDLE BAR AND CHUCKING AUTOMATIC — *Cleveland Automatic Machine Co, 4932 Beech St, Cincinnati 12, Ohio.* 8-page catalog 460 provides illustrated information on redesigned Cleveland 3-in. Model AB Dialmatic. Features include precision feed monitor that indicates exactly, in inches per minute, the feed rate for each forward and reverse setting of the five turret tools; spindle speed range of 24 to 1820 rpm; 112 spindle speeds; convertibility from bar to chucking automatic in 30 minutes; low 13.7 sec idle motion time.

7 SURFACE GRINDER—*Harig Manufacturing Corp, 5751 W Howard St, Chicago 48, Ill.* 4-page brochure 612 contains data on Model 612. Standard equipment includes automatic forced lubrication system, direct drive spindle, and choice of LH or RH longitudinal feed features.

8 SHEET POLISHING MILLS — *Acme Manufacturing Co, 1400 E Nine Mile Rd, Detroit 20, Mich.* 8-page catalog AM-3 presents illustrated descriptions of units in 30 to 74-in. capacity for finishing metal sheets, plates, and coils. Typical applications included as well as construction, operation, and specifications, plus information on how to apply mills as individual units or in tandem arrays.

9 MECHANICAL PRESS BRAKES—*Cleveland Crane & Engineering Co, Steelweld Machinery Division, Wickliffe, Ohio.* 50-page revised catalog 2023-B pictures and describes latest features and new models added to the Steelweld press line. Table on specifications has been greatly enlarged and details machines from 160 to 1250 tons, mid-stroke capacity.

10 GRINDING AND POLISHING MACHINES—*Hill Acme Co, 1201 W 65th St, Cleveland 2, Ohio.* 27-page catalog illustrates and describes line of Hill 2-roll vertical abrasive belt grinding

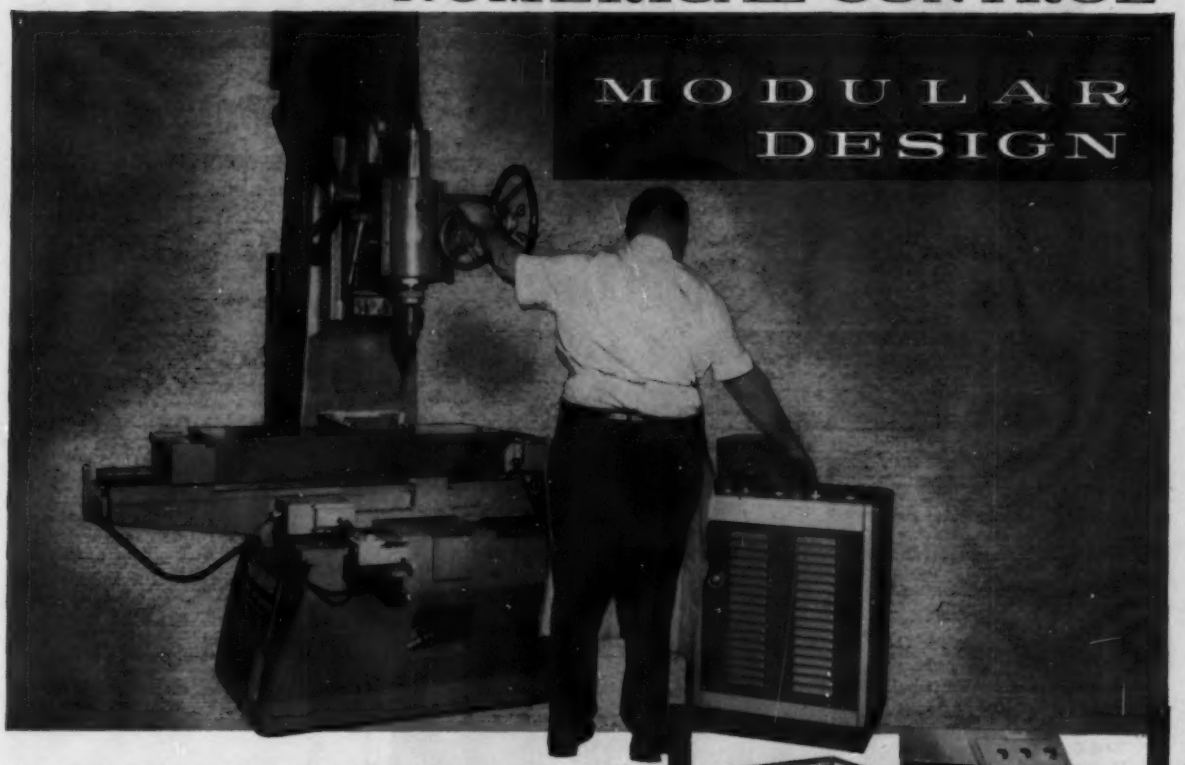
"Habbick, in a poll taken in the plant you were found to be the most liked foreman—you're fired!"

Reduce costs of...

Maintenance
Labor
Downtime
WITH

SINGER*

NUMERICAL CONTROL

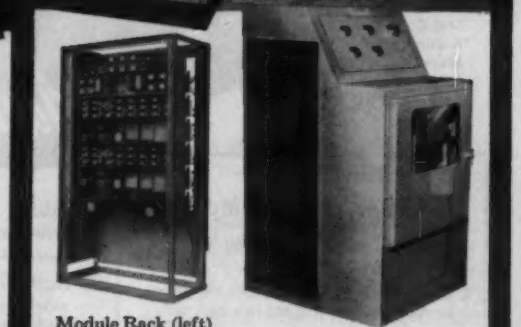


Because of the simplicity of modular design, all components within the Singer Numerical Control can be quickly and easily removed, replaced or modified.

Modular design is not the only outstanding feature of Singer Numerical Control. The high degree of accuracy is made possible by a division of the measuring section and the motor drive within the system. Accuracy of ± .001 inches on a work table with as much as 40 inches motion is another . . . increased accuracies up to ± .0002 inches are available with further refinement of the system, where compatible with the machine tool.

Singer Numerical Control Modular Design represents the most straight-forward approach to point-to-point positioning yet conceived. It offers the simplicity, reliability and economy necessary for the efficient operation of machinery.

You are invited to visit the demonstration room at Diehl Manufacturing Company's Finderne, New Jersey plant to see the Singer Numerical Control in operation and to examine actual production records. Write for the Singer Numerical Control Brochure.



Module Rack (left) contains seven easily-removed modules—the basic components of the Singer Numerical Control System—and is housed within the main Control Console. Separate modules are easily accessible and the entire Module Rack may be rolled out from the Console on the self-contained tracks. Two types of Console Cabinet are available: the smaller NEMA 1 Cabinet (at operator's hand above) and NEMA 12 Cabinet (to right of Module Rack).

†A Trademark of THE DIEHL MANUFACTURING COMPANY
*A Trademark of THE SINGER MANUFACTURING COMPANY

Diehl†

DIEHL MANUFACTURING COMPANY
SUBSIDIARY OF THE SINGER MANUFACTURING COMPANY
Somerville, New Jersey

2361

The "Other Side" of CLOVER ABRASIVES

The most important side of coated abrasives is, naturally, *the cutting surface.*

But *the reverse side* can mean more to the user than the superficial appearance of the grit. It carries data on the bond, the weight of the cloth or paper, and the kind of grain. All of this has a great deal to do with the *performance* of the product.

Moreover, the manufacturer's name is a signature. If it says "Clover" on the back, you can be sure it is the best of its kind. Ask for a new Clover Catalog and get acquainted with our full line of abrasive products—*it is good business!*

Clover Manufacturing Company

Norwalk, Connecticut

Victor 7-4515

Quality Abrasives Since 1903

Makers of the famous **CLOVER** Grinding and Lapping **COMPOUNDS**

CIRCLE 979 READER SERVICE CARD

NM Model 500-C Automatic Roll Marker for standard automatic OD marking

MARK YOUR PRODUCT

while it's being machined . . .

Automatically

Other New Method Automatic Marker Models

NM Model 700—the cut-off marker for custom OD marking.

NM Model 900—Super automatic roll marker for most types of radial end-face marking.

NM Model 600-E—for end-face marking.

★ There's a New Method automatic marker for most marking and identifying requirements, each designed for a specific need.

★ New Method also manufactures a complete line of manually operated marking devices.

- Model 500-C operates like other screw machine tools—it *advances;* it *marks* the part; it *clears it.*
- *Suitable* for either light or heavy work on automatic screw machines and other multiple-station machines
- *Eliminates* any need for costly secondary setups
- Provides *easy die change*
- Many other *practical* advantages

NOTE: See 3 types of New Method automatic roll markers in action on a screw machine at the 1960 PRODUCTION ENGINEERING SHOW in Chicago . . . Booth Number 257.

Write TODAY for the 500-C brochure

NM SINCE 1931

NEW METHOD STEEL STAMPS, INC.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

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and polishing units. Features of each of the standard machines pictured and discussed.

11 COLD METAL FORMING MACHINE—*Maclodyne Corp, Curvit Division, 19 Grosvenor Ave, East Providence, RI.* 2-page illustrated bulletin provides information on the Curvit C-155 for production line coiling and forming of pipe tube, flat stock, solid bars, angle, channel, and extruded shapes. Designed to form with gear-driven die rollers rather than slide-type dies, the machine has a maximum bending moment of 12,000 in.-lb at 80 psi air pressure. Powered by a 5-hp brake-type motor the unit will coil diameters from approximately three times the master roll diameter to infinity.

12 MILLING MACHINES — *Tree Tool & Die Works, 1000 Junction Ave, Racine, Wis.* 4-page bulletin describes features of hydraulic tracer control added to the 2UVR and 2VG machines. Scan-O-Matic control (manufactured by the Waterborg Machine Co, Racine) adds fully automatic hydraulic 3-dimensional scanning and profiling to the Tree mills yet maintains their full original ranges and capacities.

13 GRINDING FIXTURE — *Harig Manufacturing Corp, 5751 W Howard St, Chicago 48, Ill.* 4-page illustrated brochure gives details on improved Grind-All fixture for grinding irregular shaped perforators. Discusses several new features on the latest model fixture and includes information on company's radius dresser arm and ball-seat punch adapter.

14 HIGH - SPEED HYDRAULIC PRESSES — *Dowding & Doll Ltd, 246 Kensington High St, London W 14, England.* 4-page brochure presents illustrated information on new range known as the R-G consisting of three models of 5, 10, and 15 ton capacity. The 5-ton model is available either as a bench press or with pedestal for floor mounting. Strokes are 4, 8, and 10 in. respectively

(continued on page 569)

"Sure, I like to work jig-saw puzzles. Why?"

Melting furnace at Calumet & Hecla, Inc.—Wolverine Division, where Shell Irus Fluid 902 eliminates the danger of hydraulic line fires.

Ready... aim... NO FIRE!

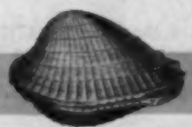
Take 10 high-temperature alloy-melting furnaces, hydraulically operated—each pouring 1500 lbs. of molten metal every hour in close proximity to "live" hydraulic lines—and you can readily see why selection of hydraulic fluids is important to Calumet & Hecla's Wolverine Tube Division.

Now the operation is made more reliable by the use of Shell Irus Fluid 902, a water-in-oil emulsion type fluid. Irus® Fluid was C & H's choice, after carefully studying other commercial hydraulic fluids—for many reasons:

1. Irus Fluid will not support combustion.
2. Irus Fluid has excellent lubricating properties.
3. Irus Fluid has hydraulic efficiency and equipment compatibility.
4. Irus Fluid is economical, costing about one-third less than other fire-resistant fluids.
5. Irus Fluid's bright yellow color makes it easy to spot and trace leaks.

In plant after plant, operators find that these advantages assure maximum safety to both personnel and equipment

If you have a hydraulic line fire hazard, we suggest that you have the Shell Industrial Products Representative show you the many advantages in Irus Fluid 902; or write to Shell Oil Company, 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif. In Canada: Shell Oil Company of Canada, Ltd., 505 University Ave., Toronto 2, Ontario.



AN INTERESTING FACT!
Every Shell Branded Industrial Lubricant is named for a sea shell. Shown here is the **Irus** elliptieus.

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

SHELL

DOUBLE DRILL LIFE

with this automatic drill pointer

accommodates drills from .032" diameters thru 1.50" diameters

produces helical, split-point and conventional points

easy set-up and high-production pointing

NEW

MODEL 100-A

WINSLO-MATIC

DRILL POINTER

Automation

IN PRECISION DRILL POINTING

Here's unmatched speed, precision and simplicity of operation in production drill sharpening.

The WINSLO-MATIC Drill Pointer is completely automatic. Operator inserts drill into workhead, and without further attention, drill is automatically chucked, grinding cycle completed, and drill ejected. Indexing is controlled at the point of the drill, hence no adjustment is required for variations in drill lengths. (No maximum drill length limitations.) Unit is extremely fast—points or sharpens up to 20 small drills per minute. Due to the ultra-precision point, drills sharpened on the WINSLO-MATIC Drill Pointer produce extremely close-tolerance holes, eliminating most reaming requirements, plus giving up to double tool life.

FEATURES AND ADVANTAGES

FULLY-AUTOMATIC CYCLE... including ejection of drills.

ULTRA-PRECISION POINT... concentric within .0002.

4 DIFFERENT WORKHEADS... available (using same basic machine), easily and quickly changed to accommodate drills from .032 thru 1.50 diameters.

FULLY-AUTOMATIC, SELF-COMPENSATING WHEEL DRESSER... selects quantity of drills pointed between dressings.

INFEED SELECTOR... controls amount of material removed.

WIDE CHOICE OF POINT ANGLES...from 45° thru 180°..

VERSATILITY... end grinds on punches, mill cutters, bottoming drills, **etc.**

Get greater production, higher profits and reduce scrap parts with this sensational machine... write today for literature and name of your nearest dealer.

Winslow PRODUCT ENGINEERING CORPORATION

47 ST. JOSEPH STREET • ARCADIA, CALIFORNIA

See the WINSLO-MATIC Drill Pointer in action. 16mm film is available showing this outstanding machine in operation.

OTHER WINSLOW POWER TOOLS YOU SHOULD KNOW ABOUT...

SPACEMATIC DRILL MOTOR A versatile tool that drills, reams and countersinks in one operation.

NUTPLATE DRILL MOTOR A portable power tool used on Nutplate installations.

SPACEMITE DRILL MOTOR A versatile, compact tool that permits close-interference drilling.

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and units incorporate power-operated return ram stroke. Ram speeds (ipm) for the 10-ton model are (standard) 390 approach, 35 pressing; (extra high speed) 630 approach, 57 pressing; for the 15-ton model (standard) 390 approach, 21 pressing; (extra high speed) 630 approach, 33 pressing.

15 DISC GRINDERS — *Besly-Welles Corp, South Beloit, Ill.* 8-page condensed catalog pictures and describes company's line of horizontal and vertical machines with dimensions and specifications listed for each model. Includes data on the Besly DH 4 double horizontal spindle disc grinder which incorporates sealed spindle quill construction.

16 CINCINNATI CENTERTYPE GRINDERS — *Cincinnati Milling Machine Co, Grinding Machine Division, Cincinnati 9, Ohio.* 4-page folder contains data on the Acrasize automatic gage control system designed to increase infeed grinding production and reduce cycle time up to 30%. Acrasize is said to eliminate effects of machine thermal changes, wheel wear, and work variations.

17 "NEWEST DEVELOPMENTS IN GEAR HONING"—*National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich.* 4-page illustrated brochure H60-6 discusses the honing principle and describes the Red Ring Model GHD gear honing machine. A four-way honing feature, crown honing possibilities, and machine operating details are covered; specifications are given for both semi-automatic and fully automatic units. Table lists production data for present industry gear tooth honing applications.

18 SHAW PROCESS PRECISION CASTING TECHNIQUE — *Shaw Process Development Corp, 82 Shore Rd, Port Washington, NY.* 56-page brochure contains information on method for producing large metallic products with higher strength and closer dimensional tolerances than previously available with any other foundry process. An unusual technique is used to produce a ceramic mold with a microscopic network of cracks which accommodates the expansion of the individual ceramic particles and allows gases to escape. Thus, porosity, cracks, surface inclusions, and other conventional foundry

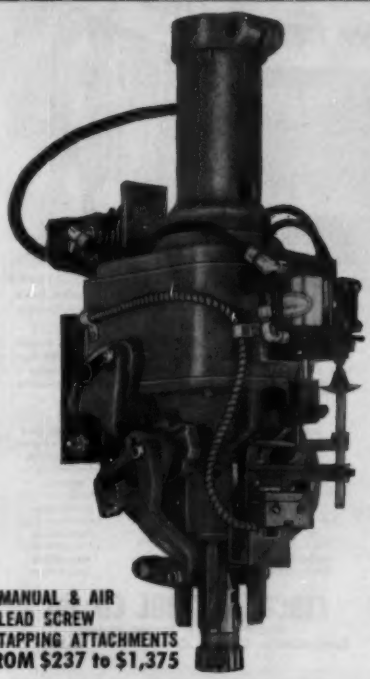
"You'd better change back to your old brand —you've started to think for yourself."

HOW TO TAP UP TO 5,000* SMALL PARTS PER HOUR WITH PRECISION AND AT LOW COST

WITH THE JARVIS AIR-OPERATED AUTOMATIC

LEADSKRU-MATIC

CHANGE PITCH IN SECONDS WITHOUT CHANGING LEAD SCREW



MANUAL & AIR LEAD SCREW TAPPING ATTACHMENTS FROM $237 to $1,375

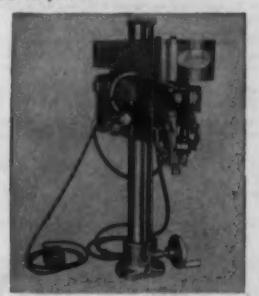
VOLUME PRODUCTION WITH PRECISION
This Air-Operated, Automatic Lead Screw Tapping Attachment converts your drill press into an extremely accurate tapping machine capable of volume production.

***5,000 SMALL PARTS PER HOUR**
Using the **LEADSKRU-MATIC** as the basic machine, one of our customers built a small parts tapping unit comprising table, hopper feeds, holding fixtures, controls, etc., which taps up to 5,000 nut blanks per hour . . . **AUTOMATICALLY. And at a lower cost** than less versatile tapping machinery!

SHORT OR LONG RUN VERSATILITY
Besides the deluxe, air-operated, adjustable pitch model shown at left, you have, according to your requirements, a choice of electrically driven, manually operated adjustable pitch tapping attachments, or conventional single pitch units. No need to pay for extra features or parts that your jobs do not require.

LEADSKRU-MATIC FEATURES WORTH YOUR INVESTIGATION

1. Adjustable Pitch — Change pitch in seconds without changing lead screw.
2. Exact thread depth control.
3. Forward and Reverse controlled.
4. Cuts tap breakage—won't rip threads.
5. 22 separate Pitch Adjustments with 2 models.
6. Longer tap life — Uniform threads.
7. Gives both speed and precision.
8. Accurate lead at all settings.
9. Adjustable stop settings for various depths.
10. Constant production with unskilled operators.
11. Fits any Drill Press.
12. Available with fixed or multiple spindle heads.



JARVIS AUTOMATIC, AIR-OPERATED LEAD SCREW TAPPER ADAPTABLE TO DRILL PRESS TABLE
Where complete automation is not desired, machine is equipped with standard hand-operated model lead screw units.

Jarvis CORPORATION
Middletown, Connecticut

SEND COUPON FOR PROMPT DETAILS

To: Jarvis Corporation 26 Pease Ave., Middletown, Connecticut

☐ Have Rep. call ☐ Send Lead Screw Cat.

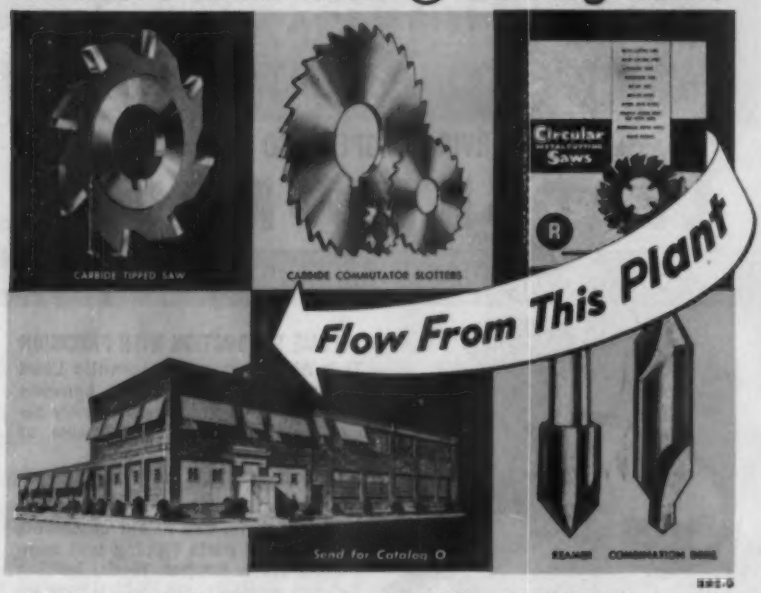
Name ..... Title .....

Company .....

Street .....

City & State .....

... More Than 1200 ® Catalog Items



CIRCLE R Circular Metal Cutting Tools originate in this plant, one of the largest anywhere devoted exclusively to this specialty. Here we design and craft more than 1200 catalog items, together with special tools designed to order. Our extensive facilities — 45,000 square feet — allow for every refinement in production of fine tools, holding within very precise tolerances where required.

CATALOG ITEMS meet practically every need in the complete range of slitting saws for metal, copper, textile metallics, plastics, rubber, sandpaper, emery cloth, etc.; cut off saws, commutator slotting saws, jewelers' slotting saws; circular knives and rotary shear blades; Deep-Cut saws, Circoloy steel saws, HSS saws, solid and tipped tungsten carbide saws, combined drills and countersinks and center reamers.

SPECIAL TOOLS are developed on order to meet your individual needs, with Circle R efficiency and economy, for cutting and slitting operations on the widest variety of materials.

PERFECTIONIST HEAT TREATING in a Circle R "exclusive." We use the latest and best furnaces obtainable, with automatic controls. Much of the specialized equipment is our own design, developed to implement our innovations in heat treating technology.

PRECISE CONTROL standardizes our quality and governs cost through use, under constant supervision, of the finest gauging and other equipment. Surface finish variations are indicated in micro-inches by Profilometer. Magnaglo inspection rules out rejects before they reach costly finishing stages — for your production, virtually eliminates costly downtime due to cutting tool defects.

FACTORY CONSULTATION SERVICE has been developed through continuous research and experience since 1923, backs up the technical advice provided for you by our Circle R Representatives — specialists in metal cutting who are at your service in all key markets.

Consult these CIRCLE R *Specialists . . .*

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CHICAGO — Donald Robertson & Co.
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DAYTON — J. O. Evans Company
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HACKENSACK — The Eaton Company
INDIANAPOLIS — Don McIntire
MEMPHIS — Branch-Marvin Tool Specialists
MILWAUKEE — Ford Tool Company
MONTREAL — Humphrey B. Walton
NEW HYDE PARK — The Eaton Company
NEW YORK CITY — J. V. Cranmore (Export)
PHILADELPHIA — General Tool Sales Co.
PHOENIX — DiEugenio Tool Center
PITTSBURGH — Dalgh Esposito & Co.
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METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS' SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

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. . . of valuable metalworking information

Your visit to AM/MM's exhibit booth at the Machine Tool Exposition can be rewarding; a selection of six important portfolios of editorial reprints will be available (and mailed directly) when you visit

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problems are eliminated. Contains both simplified diagrams and actual photos of the process operations as well as a listing of the characteristics of Shaw molds and cores and their design advantages.

19 BENDING MACHINES — *Wallace Supplies Mfg Co, 1304 Diversey Parkway, Chicago 14, Ill.* 16-page catalog covers complete line of rotary benders for forming of tube, pipe, bars, structural shapes, channels, from steel, stainless, copper, brass, and aluminum. Units range from hand to fully automatic hydraulic models. Size range is from ¼-in.-OD tube to 17-in.-OD pipe.

20 SCRAP CHOPPER — *Durant Tool Co. 1-15 Thurbers Ave, Providence, RI.* Technical bulletin gives details on complete line of 9 scrap choppers. Describes, with specifications, price, and ordering procedure, the 4 automatic units as well as the 5 models powered by the press ram independent of the die scrap choppers. Includes specifications sheet and price list for the 5 sizes of Durant stock oilers.

21 POWER PRESS CONTROL — *General Automation Corp, 50-66 Lawrence St, Flushing 54, NY.* 8-page illustrated bulletin describes the Trippet, a master production and safety control governing all power press operations from one compact unit. The A3-MC model is for all power presses having a mechanical clutch, regardless of age or make. Typical applications illustrated by line drawings. Includes information on the A3-FCA model for press brakes.

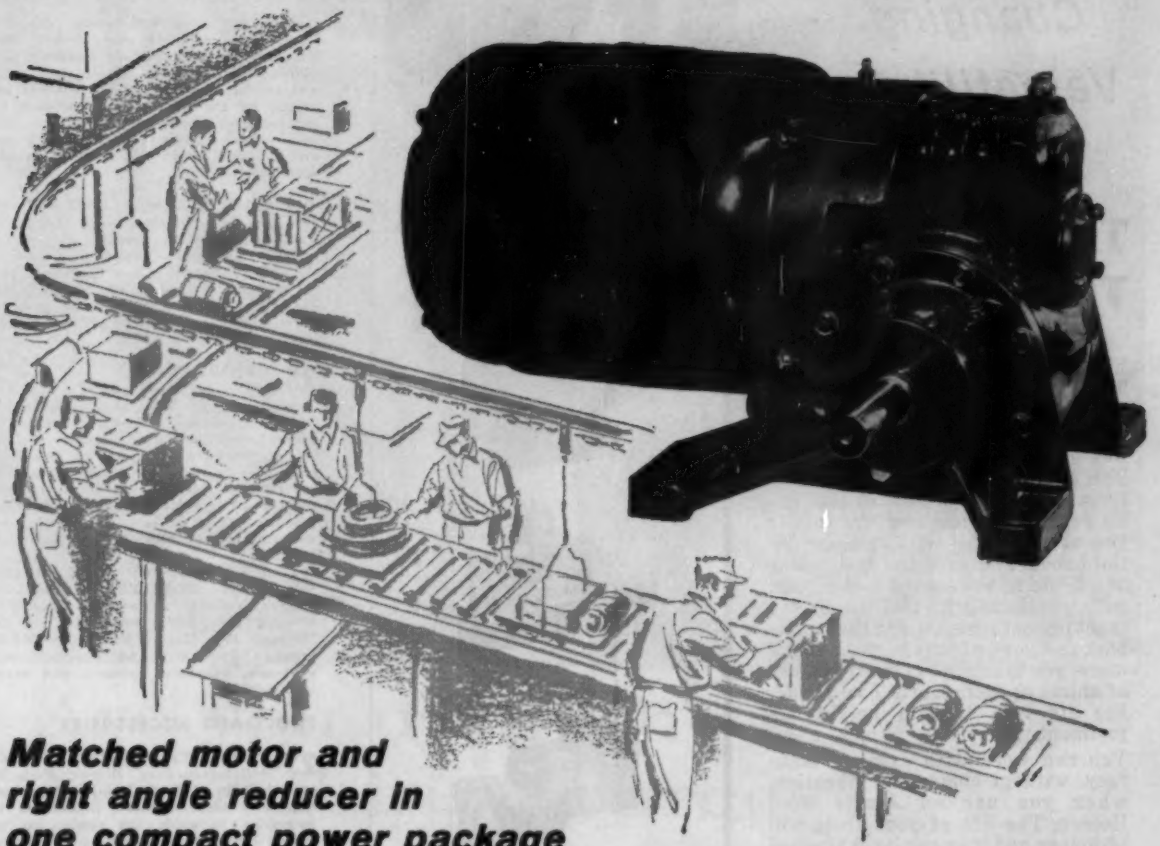
22 MILLING HEAD — *Joseph Player, 37450 Wick Rd, Romulus, Mich.* 4-page illustrated bulletin describes the Player milling head features of which include quill clamp; instant stopping; hand wheel feed; rack feed manual; gear-driven; automatic depth control; pre-loaded bearings. Eight speeds (with 1200-rpm motor) are available from 68 to 2400; quill feeds, 0.015-0.003-0.006 per rpm spindle. Quill travel is 6 in. power or manual.

23 BINDERS AND SAND ADDITIVES —*Corn Products Division, Corn Products Sales Co, 10 E 56th St, New York 22, NY.* 12-page illustrated booklet describes complete line of foundry binders and additives for both core and molding sands. Products covered include cereal

"It's triplets! We wanted you to be the first to know, Boss!"

MASTER GEARMOTORS

simplify applications—save space



Matched motor and right angle reducer in one compact power package

Reduction of engineering and assembly cost . . . elimination of separate components . . . are basic in this Master Right Angle Gearmotor. Consider these specific advantages:

1. No high speed coupling.
2. No V-belts or chains and sprockets.
3. Takes up less space—reduces mounting plates.
4. Special flange or face mounting can eliminate low speed coupling.
5. Saves aisle space . . . drives around the corner.
6. Wide acceptance by machine builder and user.

Master Gearmotors are built with ratings from ⅛ to 125 h.p. . . . in right angle, parallel or in combination. Right angle ratios are available to 96:1; parallel 120:1.

Electrical and mechanical modifications give you a maximum choice—vertical, horizontal, and flange mountings; output shaft over, under, left or right. These gearmotors can be supplied with built-in accessories: a fluid coupling for hard-to-start loads or cycling loads; a brake for fast stops and positive holding.

Call your nearest Reliance Sales Engineer. Let him tell you why more Master Gearmotors are in use today than any other make.

B-1640

Product of the combined resources of Reliance Electric and Engineering Company and its Master and Reeves Divisions

RELIANCE ELECTRIC AND ENGINEERING CO.

DEPT. 18A, CLEVELAND 17, OHIO

Canadian Division: Toronto, Ontario
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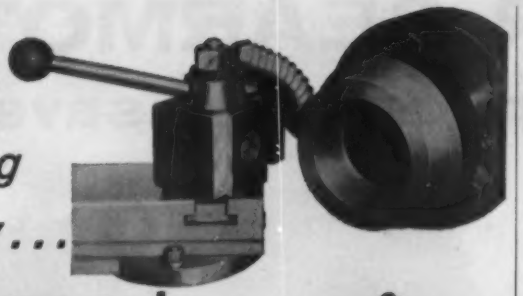
Duty Master A-c. Motors, Master Gearmotors, Reeves Drives, V★S Drives, Super 'T' D-c. Motors, Generators, Controls and Engineered Drive Systems.

For Quick Changing Versatility...



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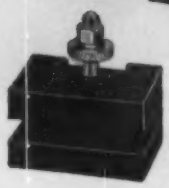
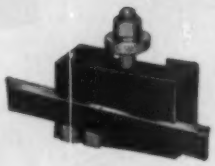
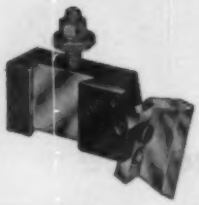
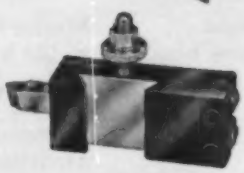
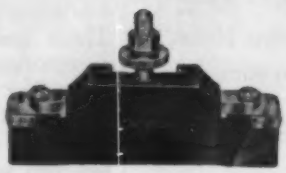
TOOL POSTS & TOOL HOLDERS











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You can change quickly and easily from one lathe operation to another. To remove the tool and tool holder you are working with, simply flip the handle and slide the tool holder out. Slide in the second tool holder, with the locked in tool bit in the exact pre-set position, flip the handle back and you're ready to run. What's more, you eliminate entirely the use of shims as each Aloris Tool Holder has its own built-in height adjustment.

You can work with extreme accuracy, without chatter or vibration, when you use an Aloris Tool Holder. The life of your tools will be longer and they can be sharpened without removing them from the Tool Holder.

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binders for cores and molds, dry and liquid baked strength core binders, dextrines for greater surface hardness, and additives for sodium silicate CO_2 cores and molds. Discusses sand properties imparted by the binders with detailed information on suggested applications. Use of corn-base additives for promoting peel and collapsibility in CO_2 sand mixes also described.

24 LEAD SCREW TAPPER — *Thriftmaster Products Corp, Lancaster, Pa.* 2-page bulletin provides information on the Lead Screw Tapper that taps all sizes of holes with one leadscrew. Describes new unit that requires only the change of one small, lowcost gear in minutes, and no leadscrew or nut change, to change tapping pitch.

25 HYDROFORMING — *Henry & Miller Industries, 675 Garfield Ave, Jersey City, NJ.* Illustrated brochure discusses advantages of hydroforming vs conventional methods; presents pictures of deep drawn parts and gives number of operations needed to produce each by conventional methods contrasted with number of operations by hydroforming. Questions such as how, when, why, are answered by descriptive data on technique.

26 DIRECTORY OF USED MACHINERY DEALERS — *Machinery Dealers National Association, 1346 Connecticut Ave NW, Washington 6, DC.* 123-page 1960 Buyers Guide lists MDNA members by states and Chapters, with addresses, telephone numbers, and executives of each.

TOOLS AND ACCESSORIES

27 PROXIMITY DIE SAVER SWITCH —*Robotron Corp, Detroit, Mich.* 32-page bulletin 27B is an instruction book that sets forth detailed, illustrated information to guide the application engineer—installation and setup procedures, operating instructions, sketches of a simplified electrical circuit and electronic diagram for the proximity die saver switch control system.

28 MAGNETIC CHUCKS AND ACCESSORIES — *Taft-Peirce Manufacturing Co, Woonsocket, RI.* 15-page catalog 414 pictures and describes features of electromagnetic chucks in rec-

(continued on page 577)

Are you up in the air over tubing sources?

If you have ballooning production problems, consider these important facts. OSTUCO Tubing is always the exact tubing you need for your product because OSTUCO Tubing is CUSTOM MADE for your product. Your order is manufactured to your own specifications to produce steel tubing especially for your application — the precise grade, analysis, size, shape, special anneal and tolerances best suited to your needs.

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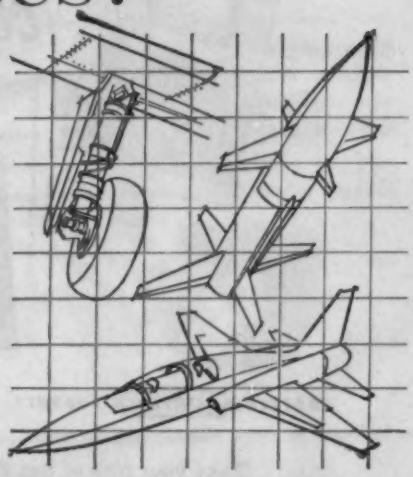
A-3483A

Model illustrated built to 3.5 mm scale.



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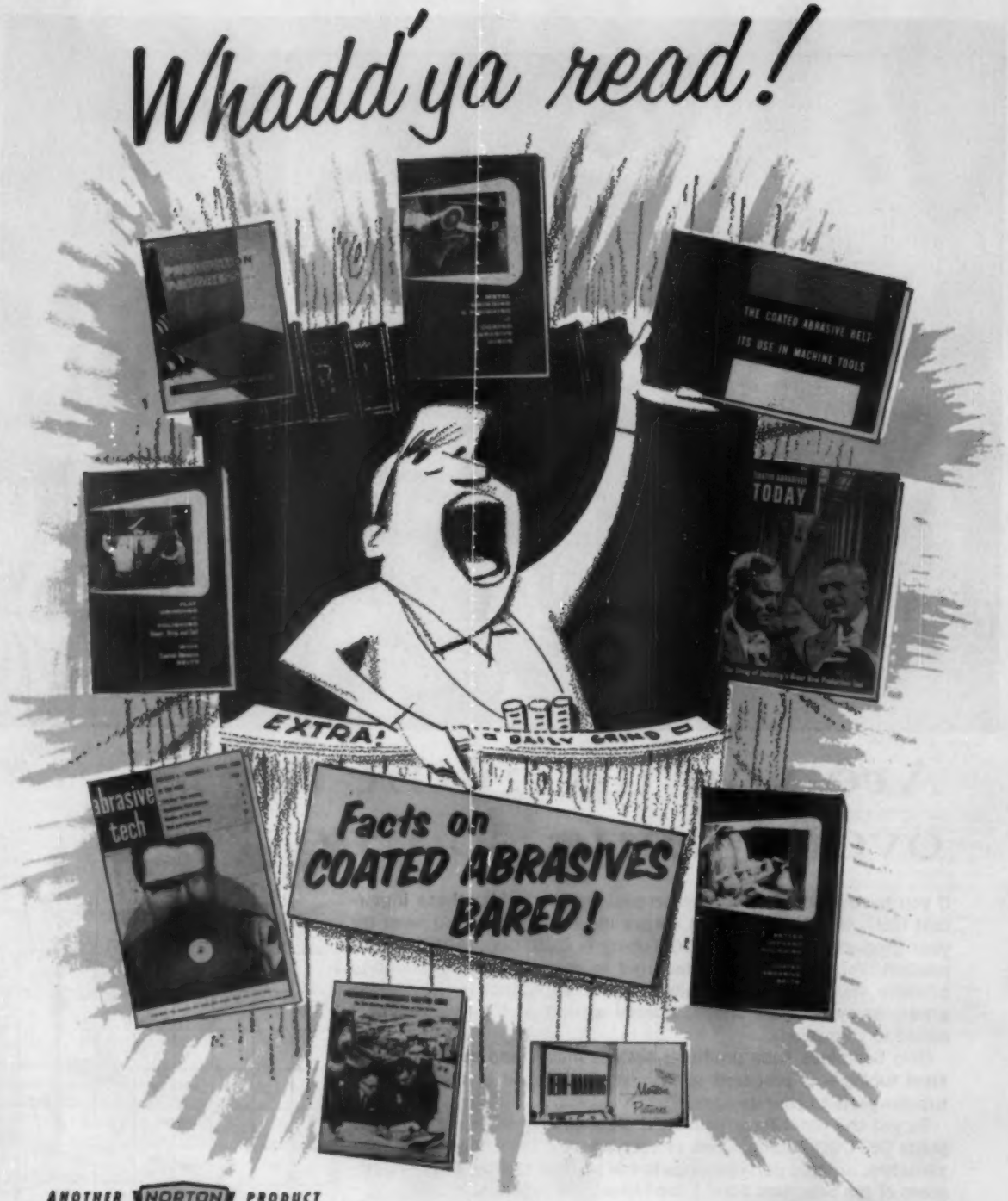

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5. Coated Abrasives Today. Shows the range and variety of these materials for every grinding and polishing job.

6. Flat Grinding and Polishing with Wide Belts. A manual describing the advantages and techniques of this important process. Concise treatment through pictures and captions simplifies all the major developments that have recently added to its adaptability, speed, and efficiency.

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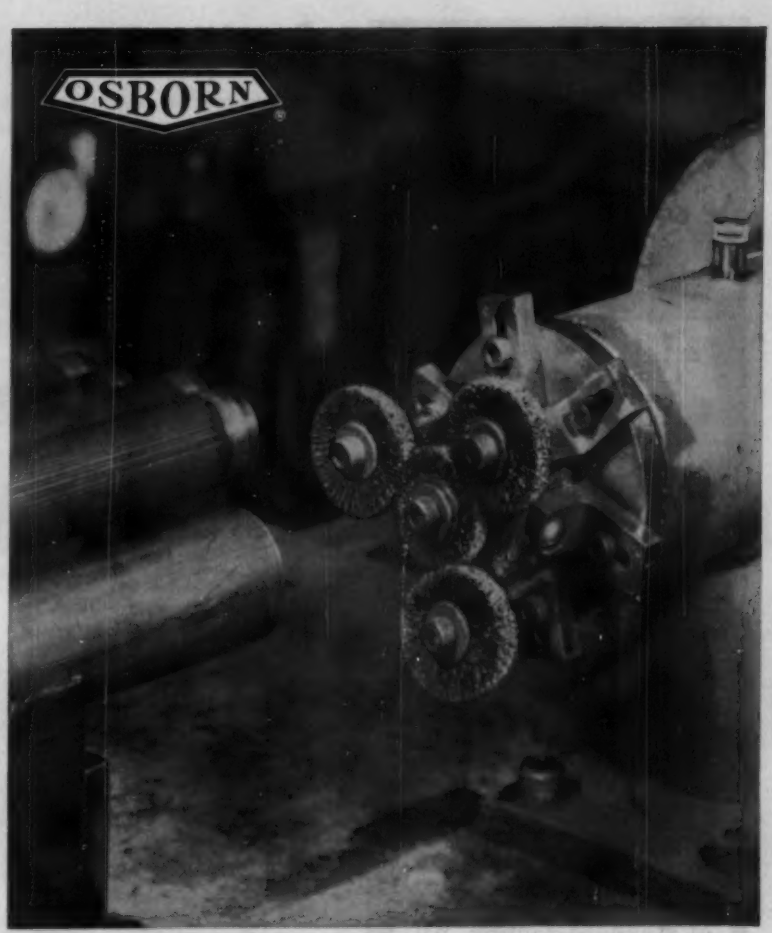
tangular, adjustable, and rotary models. Data on wiring and accessories included. Permanent magnet chucks in rectangular and sine angle models, plus their accessories, covered, as well as information on special magnetic chucks. 4-page net price list 221 included.

29 FLUIDS AND LUBRICANTS — *Union Carbide Chemicals Co, 30 E 42nd St, New York 17, NY.* 52-page booklet describes properties and uses of 32 types of Ucon polyalkylene glycol fluids and lubricants, characterized by high viscosity indexes, low pour points, chemical stability, and compatability with common metals and rubbers. Applications include lubricants for machinery; metalworking; as safety hydraulic fluids and automotive functional fluids; as solvents, plasticizers, and antifoam agents; and as chemical intermediates. Included are physical properties, physical and chemical analytical methods, storage and handling instructions, and a special section on selection of proper Ucon fluid or lubricant for any given application.

30 MAGNIFIERS — *Bausch & Lomb Inc, Rochester 2, NY.* 14-page illustrated catalog I-103 covers complete line of readers and magnifiers. Lists over 65 individual models (powers from 2 to 20 X); prices and specifications included for round and rectangular readers, folding pocket magnifiers, watchmaker's loupes, surface comparators, and enlarging focusing magnifiers. Introductory text gives helpful tips on correct working distance, how to determine magnifying power, field of view factors, and proper magnifier for individual job requirements.

31 TOOLS AND ACCESSORIES — *Karl A Neise Inc, 404 Fourth Ave, New York 16, NY.* 60-page illustrated Moderntools Red Catalog presents detailed descriptive data with prices and specifications on Walter dividing heads and rotary tables; Wohlhaupter universal Masterhead; Boremaster fly cutter; Prewo precision underdraw toolmakers and machine vises; Clampmaster all-purpose vise; Spannkinue master gripping claws; Mermod master step blocks; Boeni master multi-toolholder; Multifix quick-clamping toolholder; and a variety of calipers, gages, and protractors.

"Thank goodness morning comes only once a day!"



IN THIS SPECIAL POWER BRUSHING SETUP, five Osborn Ringlock® brushes are fixed (do not revolve individually) on a power-driven backing plate. As tubing is guided into the brush cluster, the backing plate rotates the brushes around the tubing end. Inside and outside diameters are wiped clean and cut-off burr is removed.

Tubing gets a quick clean-up

with OSBORN Power Brushing

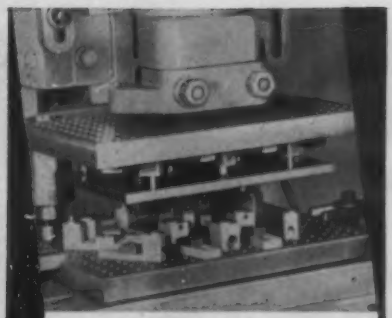
This important manufacturer of heat transfer equipment had to find a way to clean the ends of long, hard-to-handle tubing after cuttting to length. Both the inside and outside of the tubes required finishing. And the cut-off burrs needed to be removed, too.

A special machine was developed—built around five Osborn Ringlock® power brushes mounted on a power-driven backing plate. While one brush cleans the inside surface, three others clean the outside and the fifth brush removes the cut-off burr. The whole job is quick . . . thorough . . . inexpensive.

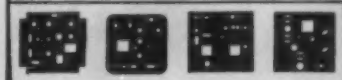
Your metal finishing problems of every description—deburring, cleaning, polishing, precision blending—can be solved with advanced Osborn power brushing methods. An **O**sborn **B**rushing **A**nalysis—made in your plant now—can pinpoint how. No cost or obligation. Write or call *The Osborn Manufacturing Company, Dept. C-101 Cleveland 14, Ohio. Phone ENdicott 1-1900.*

Osborn Brushes

Metal Finishing Machines . . . and Finishing Methods
Power, Paint and Maintenance Brushes • Foundry Production Machinery



Punch Multiple Holes in One Operation with REUSABLE DI-ACRO ADJUSTABLE PUNCHES AND DIES



Di-Acro Adjustable Punches and Dies offer you an inexpensive means of rapid tooling for multiple punching of holes of a variety of shapes and sizes. They will do the job in a fraction of the time it would take using a single station punch press and at a fraction of the cost of standard tooling. All tooling can be arranged in a countless number of patterns so that most multiple hole punching jobs can be accomplished in one operation. Tooling can be reused again and again. Holes can be as close together as 3/4" on centers. A template locates your punches and dies accurately. All Di-Acro punches and dies are concentric, readily interchangeable. Standard rounds, squares, rectangles, ovals, D's and other shapes in a variety of sizes are available from stock.

Di-Acro Adjustable Punch and Die catalog is complete with detailed instructions and prices on all die sets, punches and dies. Consult the yellow pages of your phone book for the name of your nearest Di-Acro Distributor or write us for your free copy.

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di-acro PRECISION METALWORKING EQUIPMENT

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See Di-Acro Machines in action Booth 239-65 Production Engineering show Navy Pier, Chicago September 6-10.

Free Literature

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32 QUENCHING OILS — *Sun Oil Co, Industrial Products Dept, 1608 Walnut St, Philadelphia 3, Pa.* Technical bulletin 61 contains data on Sunquench 1070 fast-quench oil and Sunquench 1021, a "hot oil" type of quenching medium. Cites typical characteristics of the new oils and outlines benefits obtained from their use. Quenching speeds measured by three widely used techniques (including GM Quenchometer) are reported for each.

33 X-RAY LITERATURE LIST — *Philips Electronic Instruments, 750 S Fulton Ave, Mount Vernon, NY.* 20-page list of references spanning the years from 1930 to 1960 gives authors and publication names, article titles, and publication dates for 376 papers on X-ray analysis subjects. Subjects covered in recent years include tooth structure; atomic and automotive problems; high temperature work; diamond tools; smelting; properties of garnets; photographic processes; oil contaminants; catalysts; and many others in chemical and metallurgical fields.

34 PRECISION FORCE GAGES — *Hunter Spring Co, Division of American Machine & Metals Inc, 1 Spring Ave, Lansdale, Pa.* 4-page bulletin 750/FG gives specifications and prices for each of the company's 21 direct reading gages which can be used for measuring both tension and compression loads in ranges of from 0-500 gr up to a maximum of 0-500 lb. Performance data, including gage capacity and readability, are presented in tabular form. Operation of the instruments is explained and illustrated.

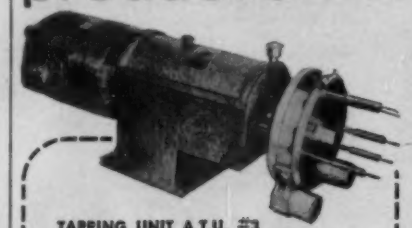
HEAT TREATING AND WELDING

35 FURNACE — *Electric Furnace Co, 600 W Wilson St, Salem, Ohio.* 12-page bulletin 601 describes and illustrates electrically heated and fuel fired continuous chain belt conveyor furnaces for clean and scale-free hardening, non-decarb hardening, carbon restoration, carburising, carbonitriding, and other heat treatment of bolts, rivets, bearing races, and a wide variety of other small and medium size parts.

36 FLASH-BUTT WELDERS — *Taylor-Winfield Corp, 1048 Mahoning Ave, Warren, Ohio.* 8-page bulletin 7-213A

"Oh he's strong all right! But he's not really very bright!!"

The Tap and Drill Team for your hole production...



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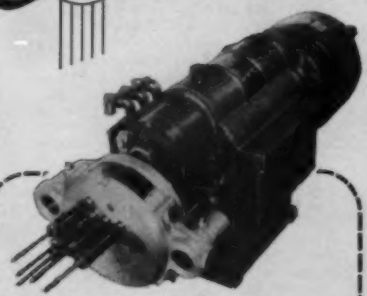
Completely self-contained all-electric lead screw precision unit. Quickly interchangeable for fast single or multiple spindle head operation. With forward and reverse electromagnetic clutches and variable torque control.

Ettco-Emrick **TAP & DRILL TWINS**



DRILLING UNIT D.U. #2
Completely self-contained precision unit with powerful air feed and hydraulic control. Quickly interchangeable for fast single or multiple spindle head operation.

Used singly or in combination they offer the flexibility and adaptability to meet modern drilling and tapping requirements. When combined with Ettco-Emrick multiple spindle heads they'll set new standards of precision, speed and economy.

SPECIAL MACHINES
Building the Twins into high production special machines is simple, because all units are electrically controlled and all components are standardized equipment. We can supply the assembly complete with tooling — or you can do it in your own plant.
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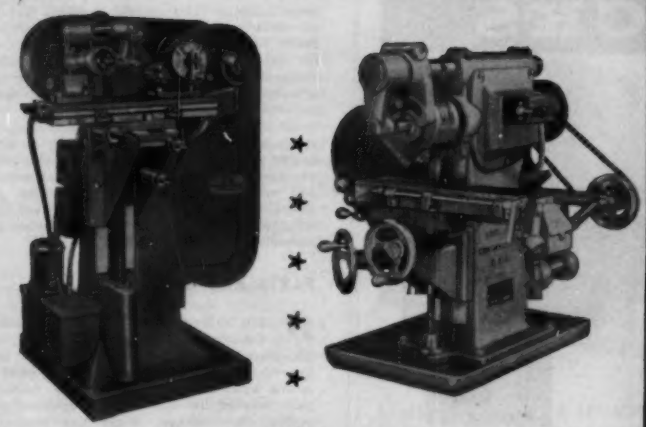

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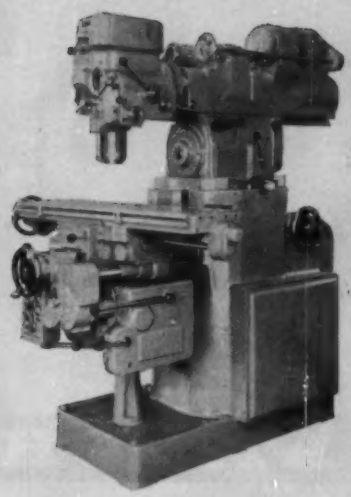

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Mills 4 ways on one machine: vertical, horizontal, angular, universal. Turret holds horizontal spindle, separately powered vertical head mounted on overarm. Turret swivels for universal operation. Power-feed to saddle and table.

New U.S. Millrite

The MILLRITE, a full-size dovetail ram and turret vertical milling machine, is ruggedly and accurately built to accepted machine tool tolerances. Yet, it is designed to sell for less than $1,000. Highly productive for precision milling and boring operations.

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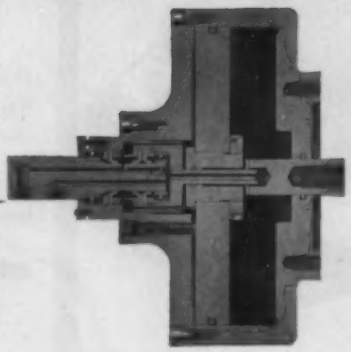
PRECISION
AT EVERY
TURN
with Whiton

AIR CHUCKS

Regardless of spindle speed, you get precision adjustment and locked-in settings with Whiton screw-adjustable air chucks. Sizes to 15" in diameter are steel forged and wedge-actuated for positive holding action at high speed. Diameters 18" and up are made of alloy steel and lever-actuated to reduce air consumption. All Whiton air chucks come equipped with American Standard jaws.

. . . and Whiton air cylinders



Whiton air cylinders feature a special stroke adjustment which easily adapts them to the different operating stroke lengths of a variety of chucks. They come in diameters from 10-20" and have iron bodies for non-critical speeds and aluminum bodies for high speed. For more complete technical data on quality chucks and cylinders, write today to:

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NEW LONDON, CONNECTICUT, U.S.A.

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describes B-5 units with photos of various types and applications. Includes complete tabulation of welding capacities, electrical specifications, mechanical specifications, automatic and semi-automatic controls, hand and air operated clamping fixtures, welding electrodes, backups, and weld upsetting mechanisms.

37 PIT TYPE CONVECTION FURNACES — *Hevi-Duty Electric Co, Milwaukee 1, Wis.* 12-page illustrated bulletin 660 describes units used for tempering, drying, bluing, steam tempering, solution and aging treatments. Available in fuel-fired or electrical models, operating ranges of up to 1850 F are provided in standard types, higher ranges in special designs. Rotair air draw furnaces covered with dimensions and specifications.

38 CONTROLLED ATMOSPHERE RESISTANCE ALLOY — *Hoskins Mfg Co, 4445 Lawton Ave, Detroit 8, Mich.* 8-page bulletin 110 contains detailed technical data on Cromel-AA, a new modified 80-20 nickel-chromium material developed for use as heating elements in controlled atmosphere furnaces. Includes table of physical properties, typical life and temperature-resistance curves, as well as test data showing the material's resistance to carburization and sulfur corrosion in controlled atmospheres. Specification tables list resistivity and density values in all standard wire and strip sizes. Formulas are given to facilitate conversion of existing atmosphere furnaces from other resistance materials to Cromel-AA.

PARTS AND MATERIALS

39 MOTOR COUPLINGS — *Link-Belt Co, Prudential Plaza, Chicago 1, Ill.* Illustrated bulletin 2875 covering MC geared flexible motor couplings for electric motor applications describes new features incorporated in line. These include corrosive duty covers; large size coupling, extending range to 2 ½ in. bore; and new spacer adapter which functions as a demountable, rigid extension of the motor shaft.

40 CLUTCHES AND BRAKES — *Wichita Clutch Co, Wichita Falls, Texas.* 32-page catalog on air-tube disc clutches and brakes contains complete specification data and photos covering all types of applications. Includes suggested clutch and brake arrangements to help in design or unusual applications.

41 COATINGS SELECTOR — *Bee Chemical Co, Logo Division, 13933 S Stony Island Ave, Chicago 33, Ill.* Charts which can be mounted for ready reference, are a guide to selection of specialty coatings available for application on plastics, metals, glass, and wood. They show uses and characteristics of company's spray, dip, and flow coating materials, vacuum metallizing coatings, and standard plastisol formulations.

42 ROTOFORMED PARTS — *Commercial Shearing & Stamping Co, 1775 Logan Ave, Youngstown 1, Ohio.* 8-page bulletin 500-P4 explains rotoforming, a method whereby cold metal is pressure-shaped into desired thicknesses and circular shapes. Description of the machine, various shapes that can be formed, range of possible sizes, types of finishes, and the metals and alloys best suited for rotoforming are included. Typical shapes and blanks are illustrated with line drawings. Fifteen representative samples of rotoformed components are pictured with dimensions, blank, metal used, finish, and end use listed for each.

43 THRUST BEARINGS — *Rollway Bearings Co, 541 Seymour St, Syracuse, NY.* 28-page catalog PT-659 on cylindrical roller precision thrust bearings provides detailed engineering data on improved line with an average of 30% greater load capacity, and a new line of thrust bearings with metric dimensions. Detailed information on dynamic and static bearing capacities, the company's tandem thrust bearings, new sizes of crane hook bearings, and bearing applications is included.

44 DUCTILE PERMANENT MAGNET ALLOY—*Hoskins Mfg Co, 4445 Lawton Ave, Detroit 8, Mich.* 4-page illustrated brochure describes properties and applications of an improved copper-nickel-iron alloy of the generic Cunife type. Properties listed include high coercive force and energy product values, said to be comparable to those of cast or sintered Alnico II and III, plus excellent ductility, malleability, and machinability.

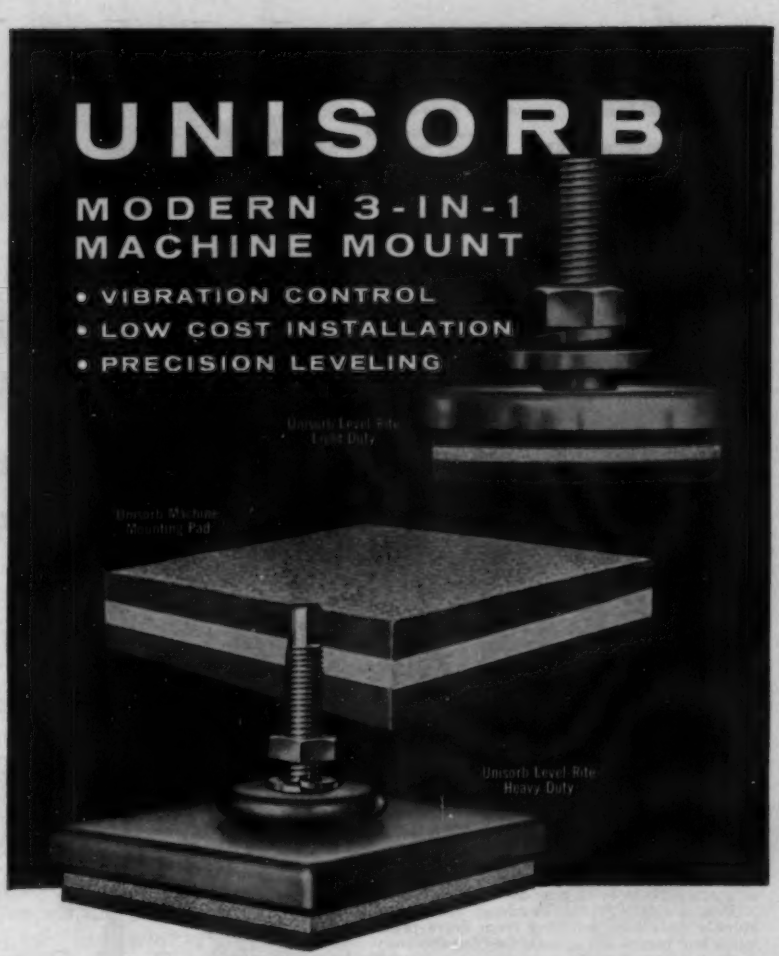
45 ELECTRICALLY OPERATED VALVES—*Airmatic Valve Inc, 7312 Associate Ave, Cleveland 9, Ohio.* 20-page illustrated bulletin 91024 describes 2, 3, and 4-way valves. Includes specifications, outstanding features, flow charts, optional features, ordering data, and dimensions.

46 V-BAND COUPLINGS — *Aeroquip Corp, Marman Division, 11214 Exposition Blvd, Los Angeles, Calif.* 4-page brochure contains complete design information on V-band couplings for connecting and sealing all types of tubing, piping, ducts, containers, or structural devices for both aircraft and industrial applications. Coupling sizes can be obtained in any increment from the minimum diameter of the particular coupling to the maximum diameter of the application.

47 WEIGHT TABLES OF STEEL—*Joe Dyson & Sons Inc, 5125 St Clair Ave, Cleveland 3, Ohio.* 72-page booklet gives weights of round and square steel bars in sizes from ⅛ through 47⅞ in. Similar comprehensive tables give weights of square, round, hexagon, and octagon steel bars, to the hundredths of a pound. In addition, decimal equivalents, tables of area and circumferences of circles, and other formulas are listed.

48 VARIABLE SPEED DRIVES—*Zero-Max Co, 1952 Lyndale Ave South, Minneapolis 5, Minn.* 16-page catalog ZM-400C560 covers stepless drives for fractional horsepower applications. Typical applications listed and illustrated; operating features and installation suggestions are accompanied by diagrams and tips on power transmission. Details on all types of units, with or without motor, in the new 400 Series are included.

"There's what you would call being fireproof. . . . He's J. B. Acme's cousin . . ."



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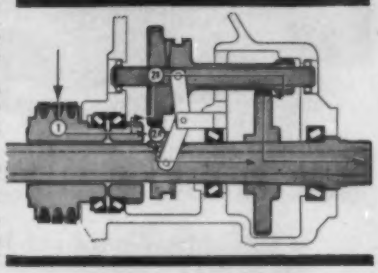
Power Accuracy and Price

Photograph (actual size) of chip cut on R Series 15" Sheldon lathe. Depth of cut .250", Feed .016", Spindle Speed 400 r.p.m., Steel B-1112, Dia. of Work Piece 3".

"Free Running" spindle (Patent Pending) has no drive pressures to cause deflection. (See cut-out below.)



SHELDON

R-Series 15" Precision Lathes

Revolutionary in concept and design, these lathes deliver extra power and accuracy to the spindle nose.

Power is transmitted through 3 steel cable V-belts to the headstock input pulley assembly. (1) It is held free from the spindle by its own large tapered roller bearings. The input (1) assembly, then, absorbs all the drive pressures and transmits power to the free running spindle through a clutch (2A) in direct drive or gears (2B) in back gear drive.

This design (Patent Pending) eliminates spindle deflection resulting from drive pressures and leaves the spindle free for accurate work holding. Spindle nose runout is .0003" or less.

Other features include large 1½" hole through spindle . . . 60 pitch gear box with built-in lead screw reverse lever . . . apron that runs in oil and has independent drop lever clutches for power feeds . . . cam action tailstock clamp for rapid locking and instant release.

Write for bulletin and sample accuracy test sheet.

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CIRCLE 557 READER SERVICE CARD

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NEW BOOKS...

STANDARDS PUBLISHED BY ASME — *Available from the American Society of Mechanical Engineers, 29 W 39th St, New York 18, NY, or from the American Standards Association, 10 E 40th St, New York 16, NY.*

Reamers—*Available for $2.50.* ASA B5.14-1959 covers nomenclature, definition, types, sizes, and tolerances for reamers. Includes a comprehensive glossary of reamer terms, plus tables of tolerances and general dimensions for 37 types. Principal revisions are in the areas of nomenclature and the addition of standards for a greatly extended series of HSS straight shank reamers. Nomenclature has been revised to conform to that used in the revised standards for other metal cutting tools such as twist drills, milling cutters, and taps. Minor changes have been made in tables of sizes and types as well as in tolerances of various elements to reflect current requirements in their field.

Single Point Tools and Toolholders—*Available for $1.* ASA B5.29-1959 covering HSS and cast non-ferrous single point tools and toolholders presents sizes and tolerances for the two types of toolbits which are in common use for general purpose machining. Nominal shank sizes of single point toolbit holders are included. New standard is a partial revision of B5.22-1950, Single Point Tools and Tool Posts. What remains in B5.22 is the basic terminology and nomenclature of single point cutting tools and data concerning toolposts.

Dimension and tolerance tables are included in the new standard for

"If I was you, Pop, I wouldn't start complaining about your poor little worn out push-button finger!"

NEW DIMENSIONS IN DESIGN

NEW CONCEPTS OF ECONOMY

ACIPCO CERAM-SPUN Steel Tubing

In all types of industry, versatile Acipco centrifugally spun tubing is giving the design engineer greater freedom. Furnished with the exact combination of physical, chemical and metallurgical properties required by design, manufacturing and service conditions, high quality Acipco tubing helps create both new dimensions in design and new concepts of economy.

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COMPLETE FACILITIES

SPINNING

Acipco Steel Tubes are centrifugally spun to exact physical and metallurgical specifications. The exact size and metal analysis your process or project requires is assured.

FABRICATION

Complete, integrated facilities for machining, welding, finishing and heat treating of tubular parts save shipping time and expense for Acipco customers.

TESTING

Facilities for both hydrostatic and air testing, as well as for other physical and chemical analyses and tests, are available as part of complete Acipco steel tube service.

INSPECTION

Expert inspection, including radiography, during all phases of production, helps keep Acipco steel tube quality high.

TECHNICAL ASSISTANCE

A staff of highly trained engineers, metallurgists, chemists and craftsmen serves the designer and manufacturer who specify Acipco Steel Tubes.

SIZE RANGES: Tubes are produced in lengths from 4′ to 20′; longer lengths can be made by welding. O.D.'s from 2.25″ to 50″—wall thicknesses from .25″ to 8″.

ANALYSES: All alloy grades in steel and cast iron, including heat and corrosion resistant stainless steels, plain carbon steel and special non-standard analyses.

FINISHES: As cast, rough machined, or finish machined, including honing and grinding. Complete welding and machine shop facilities are available.

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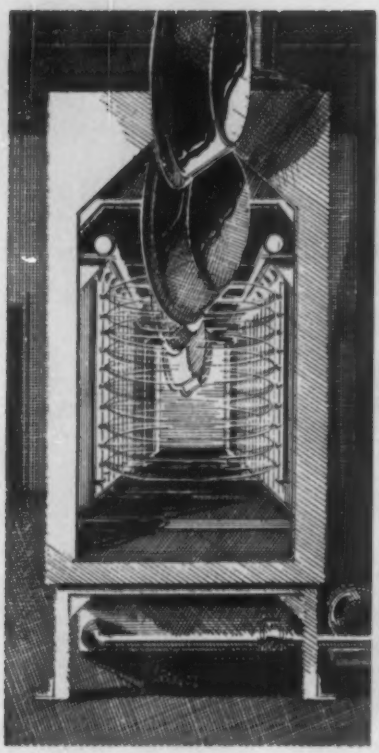

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NEW BOOKS . . .

three classifications: ground, preground, and unground toolbits. Fourth table covers shank dimensions of toolbit holders for turning tools, cutting-off and side tools, boring, threading, and knurling tools, and planer and shaper tools.

Metal Stampings—*Available for $1.50.* ASA Y14.10-1959 is Section 10 of the American Drafting Standards Manual. It is one of 18 sections of the ADSM which, when completed, will provide the means for uniform drafting practices throughout the US and most of the other English-speaking countries. In addition to Section 10, Sections 1 through 7, and 9, 11, and 17 have been published; the other sections are in preparation.

Purpose of this section is to indicate basic empirical layout and drafting practices specifically related to metal stampings. An attempt has been made to provide a means for imparting general design knowledge acquired by various manufacturers through years of experience. Practices commonly used by small parts manufacturers in the production of metal stampings as produced on standard types of punchpresses are covered. Methods of dimensioning are in accordance with Sections 5 (Dimensioning and Notes) and 16 (Tools, Dies and Gages) of the ADSM.

The term "stamping" as used in Section 10 refers to pressworking of sheet metal to change its shape, either with or without accompanying shearing or punching. Stampings are divided into two general classes: (1) those made by cutting the material, either to change pe-

"I had to cut out the happy pills. I got nicked for nine raises in two weeks!"

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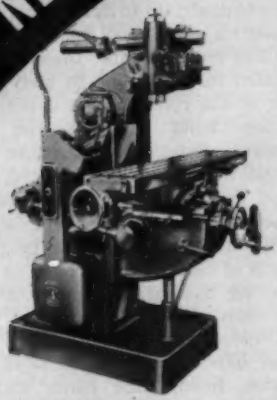

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Combined Horizontal-Vertical Milling Machine

Angle from 0° horizontal position to 45° vertical position.

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- ALL STEEL CONSTRUCTION
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8" gaps on all models. Cuts thin and heavy gauge accurately.

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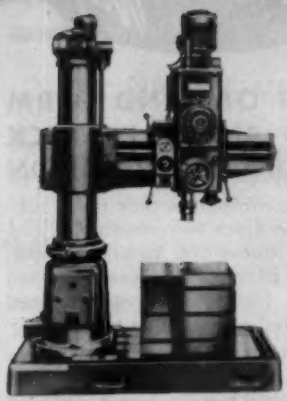

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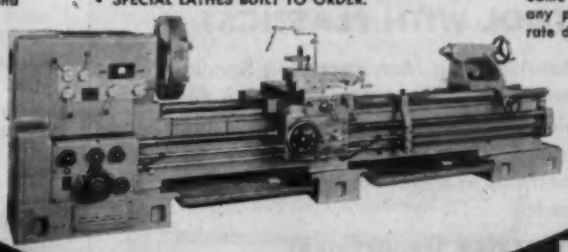

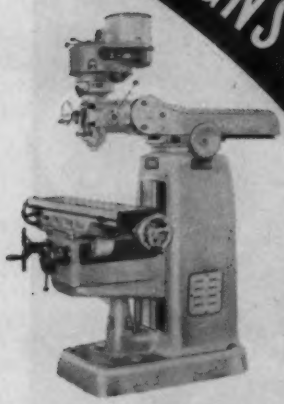

IMPERIAL (Westbury)
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Compound "Knuckle Joint," 12" cross travel, 1½ H.P. 42" x 9" table, coolant system, one shot lubrication. Available with power feed to table, measuring and slotting attachments, accessories. Milling operation at any angle. **Complete $2214.00**

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TO CUT OFF AND FORM TUBING AND BAR STOCK *IN A SINGLE OPERATION*

Here is a combination that feeds tubing and bar stock — automatically — to a fast, automatic cutting-off machine. Best of all, the pieces being cut off can be formed, grooved, flanged or chamfered at the same time.

There are models that handle tubing, pipe and bar stock from ⅛" diameter up to solid bar stock of 3" OD and tubing up to 8" OD.

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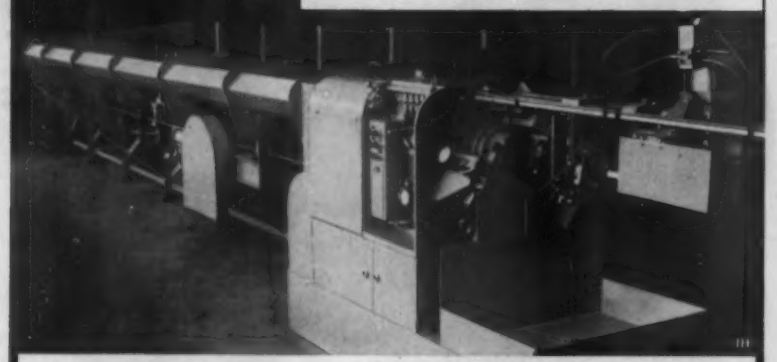

FREE TRIAL OFFER. Safe, positive, fast set-ups. The Modern Safety Drill Table handles odd, irregular shapes without V-blocks, clamps or parallels. Ideal for maintenance work. Guaranteed to save its cost in labor alone every 6 months. Sizes from 8" to 27½" dia. Try it at our expense. No obligation.

CIRCLE 562 READER SERVICE CARD

WANT TO TOOL WITH PLASTICS?

American Machinist/Metalworking Manufacturing Special Report Number 410 outlines the plastics most widely used; the new materials now available; and the new toolmaking techniques that are being developed. Case histories illustrate current applications of these methods in Metalworking. Send 25¢ and your name and address to:

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NEW BOOKS . . .

ripheral outline or to produce openings in the interior of the piece, and (2) those made by forming the material to the shape desired from a flat piece without cutting.

Large Rivets—*Available for $1.50.* ASA B18.4-1960 for rivets larger than ½ in. nominal diameter has been brought up to date. Revision includes a table of tolerances for various rivet lengths; these are designated in proportion to body diameter of the rivet. Types covered are button head, high button head (acorn), flat-top countersunk head, round-top countersunk head, cone head, and pan head. Tables for each type designate standard diameter of body, diameter of head, height or depth of head, radii of head or other limiting dimensions, and tolerances for each of these dimensions.

Dimensions of manufactured heads after driving, for button head, high button head, cone head, and pan head types, as well as for hold-on (dolly bar) impressions, are included in this standard. These dimensions apply also to driven heads of rivets as formed from the end and the corresponding rivet set impressions.

Fluid Power Diagrams — *Available for $1.50.* ASA Y14.17-1959 is Section 17 of the ADSM. It establishes standard drawing practices for depicting systems that use a fluid (liquid or gas) within enclosed circuits to transmit and control power. Explains in detail the data and notes that should accompany symbols and lines to make a diagram meet the requirements of engineering, sales, purchasing, and maintenance.

Four types of diagrams are covered: pictorial, which show only external features of components; cutaway, which show principal internal working parts; graphical, which provide a simplified method of showing function and method of operation of each component; and combination diagrams, which combine the previous three to emphasize for each part the function that best suits the purpose of the diagram. Standard symbols illustrated for each type of diagram include components; piping; and capacity, power, and other ratings. Standard drafting practice is used for such things as line conventions, lettering, sheet size, and title block.

Safety Code for Powered Industrial Trucks—*Available for $1.50.* ASA B56.1-1959 (revision) includes a

new appendix on stability tests which describes construction and use of a tilting platform test device for industrial trucks. Four tests can be made with this platform: longitudinal stability while stacking and traveling, and lateral stability while stacking and traveling. Trucks include fork, platform, crane trucks, and tractors used in factories and other industrial operations.

Elements of design, operation, and maintenance are covered, as well as nomenclature changes. The 48-page publication discusses such design and construction features as overhead guards, steering geometry, braking efficiency, and capacity ratings.

Pallet Sizes—*Available for $2.* ASA MH1.1-1959 provides for 11 standard pallet sizes, eight rectangular and three square. Objective of the new standard is to provide an adequate selection from a minimum number of sizes, and to provide maximum efficiency, interchangeability, and flexibility.

Publication includes a series of charts, or areagrams, for various standard size carriers. For example, pallet size R-3, 36 x 42 in., is most effective for a standard 50-ton boxcar, allowing 1-in. clearance with no overhang. Areagrams for pallet loads with 1½-in. overhang are also included. In addition to areagrams for each size of pallet, there are charts for computing volumetric efficiency in relation to height of load.

Four of the ASA pallet sizes are being proposed by the International Organization for Standardization (ISO) as international standards recommendations: R2, 32 x 40 in; R4, 32 x 48 in.; R6, 40 x 48 in.; and R8, 48 x 72 in. An International Pal-

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. . . FOR SURFACE MEASUREMENT

PROFILOMETER® — Measures the roughness of practically *all* machined and finished surfaces, internal and external, in microinches (arithmetical or r.m.s. average height). Fast; dependable; easy to use.

PROFICORDER® — Draws magnified profile of internal and external surfaces, showing absolute deviation from flatness or roundness. Chart shows *roughness* only, *waviness* only, or *total profile*, as desired; permits measuring height, width and spacing of waves, bows, steps, roughness and other irregularities.

MICROCORDER® — Draws magnified profile of internal and external surfaces along straight path of trace. Chart shows pits, pores, scratches, chatter marks and similar irregularities in detail.

WAVOMETER® — Measures the microinch height of waviness irregularities (r.m.s. average) around internal and external surfaces of rotation on a production basis.

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VAROMETER® — Measures runout of spindles, shafts, wheels etc. while the parts are rotating. Also used for surface analysis.

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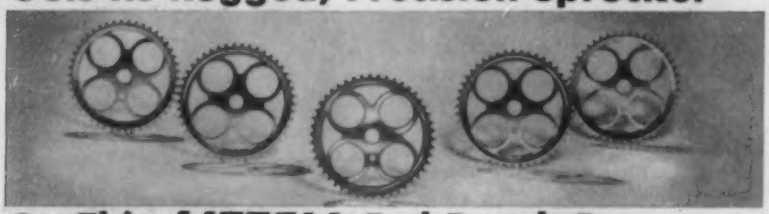
The Schwinn Bicycle

Gets Its Rugged, Precision Sprocket



On This *LITTELL*-Fed Punch Press

Stamping out sprockets for famous Schwinn Bicyles is *precision* stamping. The special high strength steel stock is perfectly conditioned for accurate work. Flat stock, free of coil curvature, reaches the die area at perfectly timed intervals. For sprockets and other vital parts, Schwinn achieves this straightening-feeding precision economically, using the Littell "HRP" self-powered, hydraulically driven feeding and straightening machine. The "HRP" will serve you as well.

"HRP" is Versatile, Accurate, Convenient

The straightening-feeding cycle of the self-powered HRP unit is synchronized with the stamping cycle of the press by a single electrical connection. HRP units remove the coil curvature, and feed the straightened stock to the press or shear at precisely the desired speed. They feed from either side of the press, or from front to back. They can be positioned at special angles to produce specially shaped parts. Pulling an electrical plug disconnects the "HRP" from the press. Furthermore, the "HRP" can be easily moved from press to press by a lift truck. Facts in Bulletin B-10.

3 STANDARD "HRP" SIZES

STOCK CAPACITIES

12" wide x .090" thick
18" wide x .062" thick
24" wide x .050" thick

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NEW BOOKS . . .

let Pool has been established by the European Council of Ministers of Trade which permits only one size to be used, 32 x 48 in. The International Chamber of Commerce has endorsed the IPP, and methods of giving preferential treatment and reduced rates to goods shipped on this size are being considered. This size is included in the new standard and is designated R4.

•

STANDARDS PUBLISHED BY ASA — *Available from the American Standards Association, 10 E 40th St, New York 16, NY.*

Prevention of Aluminum Dust Explosions—*Available for 40¢.* One of 16 such codes for the prevention of dust explosions drawn up by the National Fire Protection Association, this is titled American Standard Code for the Processing and Finishing of Aluminum, Z12.19-1959. Two other ASA Codes for the prevention of dust explosions in the metals field have been revised by NFPA and approved as American Standards. They are American Standard Code for the Prevention of Dust Explosions in the Manufacture of Aluminum Bronze Powder (Z12.11-1959, 50¢) and American Standard Code for Explosion and Fire Protection in Plants Producing or Handling Magnesium Powder or Dust (Z12.15-1959, 40¢).

The aluminum finishing code, officially adopted by NFPA in 1956, was amended this year by the addition

"I've tried everything else—I suppose I might as well look at the blue print."

Adamas Carbide's Record at Ford

...proves it pays to select by performance!

ADAMAS JOB REPORT FOR:

Ford Motor Company

PLANT: Sterling Plant, Warren, Mich.

PART(S): Ford Rear Axle Shafts—No. 4235

MATERIAL: SAE-1038 Steel Forging, Brinell 179-229

MACHINE: Snyder Lathe

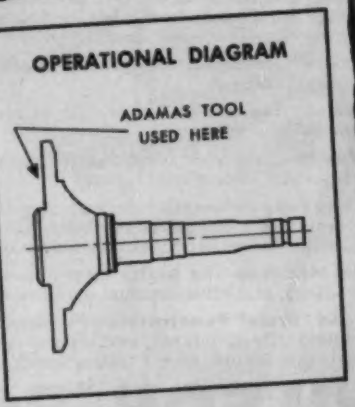
OPERATION: Flange Facing—6.47 flange OD to 2.46 pilot diam. ... 930 to 360 sfpm. ... feed .016 ... depth of cut .030 to .090 variable

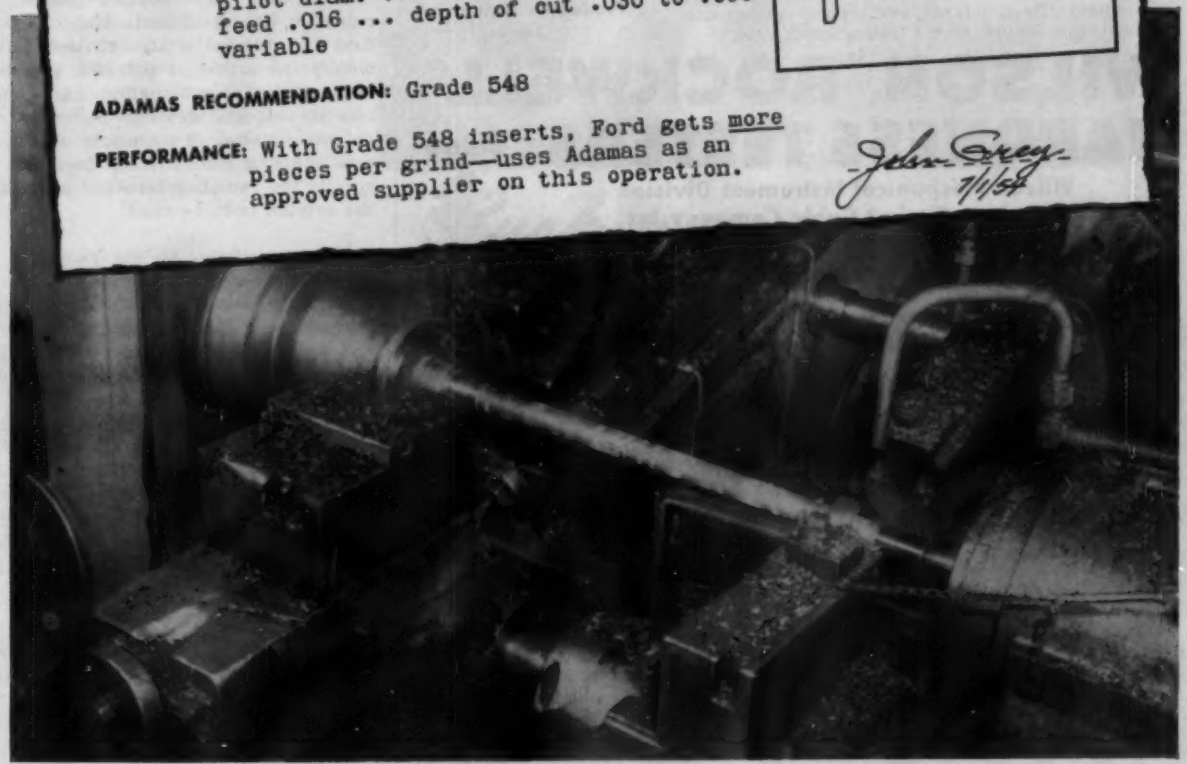
ADAMAS RECOMMENDATION: Grade 548

PERFORMANCE: With Grade 548 inserts, Ford gets more pieces per grind—uses Adamas as an approved supplier on this operation.

John Gray 7/1/59

OPERATIONAL DIAGRAM





■ The ability of Adamas Grade 548 to face flanges on more rear axle shafts, at minimized tool grinds, has greatly assisted in enabling Ford to substantially increase production. It has also played a part in Ford's obtaining lower tool costs ... longer tool life ... less machine downtime ... faster feeds ... variable speeds ... virtual elimination of rejects.

■ Grade 548's record 6-year run at Ford: optimum capability for consistent high performance and profitable volume production ... Another outstanding example of what is being accomplished by Adamas in plants of all sizes throughout the country.

■ Adamas produces standard and special tungsten carbide products for every metalworking application. For details on Adamas Performance-Proved carbide products best suited to your requirements contact your nearest Adamas representative or write direct.

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No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

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"Rockwell" Superficial Tester—for extremely shallow indentations.

TwinTester—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

Semi and Fully Automatic—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

Special Machines—for testing large objects, internal readings, and other unusual applications.

Diamond "Brale" Penetrators—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.

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WILSON "ROCKWELL" HARDNESS TESTERS

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Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
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REPLACE SOLID BUSHINGS with JERGENS ADJUSTABLE BEARINGS

JERGENS "LIVE" BUSHINGS

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- Use Economical Carbide Cutters
- Provide Greater Precision
- Available for ½" to 6½" Shafts
- Will stand greater sidewall pressures

Get time, tool, and money-saving advantages by replacing solid bushings with Jergens adjustable roller bearing units. Available for ½" to 6" shafts or with straight roller bearings where space is a factor in ½" to 2" shaft sizes. Write today for complete information and authentic case histories.

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New! STANDARD MACHINE BASES SAVE ENGINEERING TIME!

The building of bases for machines can now be greatly expedited by the use of standard machine bases such as is illustrated above.

As stock items immediately available, the standard bases save both engineering time and fabricating time, thereby greatly reducing construction costs. They also have a high salvage value because they can be used over and over again by simply making changes in tooling.

The bases entirely of welded construction, are made of steel plate ranging from ⅜" to ⅞" in thickness. The parts are so designed that any size of base from 24" to 48" in length or width and from 24" to 54" in height may be had.

WRITE FOR LITERATURE

Some Territories Still Open

INTER-LAKES ENGINEERING CO.
29200 Groesbeck Highway
Mount Clemens, Mich.

NEW BOOKS . . .

of a paragraph giving precautions to be followed when powder-operated tools are used. It indicates the practices necessary to reduce the possibility of fires or explosions for industries where aluminum and aluminum alloys are subject to processing or finishing operations in which a fine metallic dust or powder is liberated. It applies to operations such as grinding, buffing, and polishing. Also covers handling and storage of aluminum powder by processors.

Radiation Symbol—*Available for 50¢.* ASA N2.1-1960 formally recognizes the purple trefoil (three-bladed propeller) on a yellow background as the proper symbol to denote radiation hazards and specifies general rules for its use. Standard specifies that the symbol shall be used to signify the actual or potential presence of ionizing radiation and to identify objects, devices, materials, or combinations of materials which emit ionizing radiation. It does not specify the radiation levels at which the symbol is to be used.

Pulleys—*Available for 60¢.* Two new standards recommendations which establish the diameters and tolerances of pulleys as well as the shape and approximate dimensions of the crowns of pulleys for flat transmission belts have been drawn by the Pulleys and Belts Technical Committee of the International Organization for Standardization. Recommendations are ISO R 99, Diameters of Pulleys for Flat Transmission Belts, and ISO R 100, Crowns of Pulleys for Flat Transmission Belts.

•

1960 PRICE LIST AND INDEX OF AMERICAN STANDARDS—*Published by the American Standards Association, 10 E 40th St, New York 16, NY. No charge.*

Lists 1900 American Standards that have been approved to date. Fields covered include automotive, chemical, civil engineering and construction, drawings, symbols, abbreviations, electrical engineering, metallurgy, materials handling, mechanical engineering, mining, nuclear, photography and motion pictures, paper, petroleum, rubber, textile, wood, safety, gas appliances, and some consumer goods. Also listed

CIRCLE 567 READER SERVICE CARD CIRCLE 568 READER SERVICE CARD

are the international standards recommendations of the International Organization for Standardization and the International Electrotechnical Commission.

•

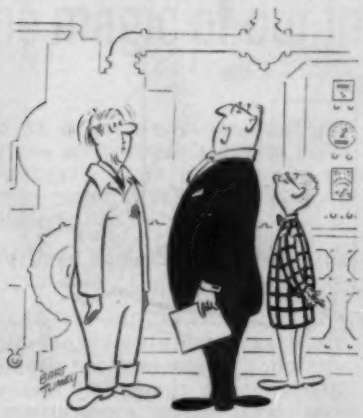
MACHINE TOOL ELECTRICAL STANDARDS—*Published by National Machine Tool Builders' Association, 2139 Wisconsin Ave, Washington 7, DC. No charge.*

Newly revised set of "Machine Tool Electrical Standards," as adopted Jan 25, 1960 by the Electrical Standards Committee of the NMTBA, is available in booklet form. New version has been developed specifically for machine tools. Objectives have been to make tools safer to operate, more productive, and less costly to maintain. Information on electronic and static devices is included for the first time although it is regarded as impossible at present to write a complete set of standards for them within the limited scope of current experience.

•

DESIGNER'S GUIDE FOR WELDED CONSTRUCTION—*Published by Lincoln Electric Co, Cleveland 17, Ohio. No charge.*

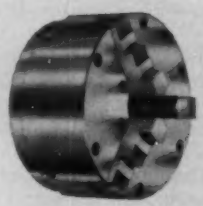
Publication 1100.1 includes recent revisions in the Standard American Welding Society Symbols. Contains charts and illustrations providing information on the application of welding symbols and other basic design data on welds.



"Jenkins, teach my son everything you know . . . then, tomorrow . . ."

Only a rich man can afford old-style chucks!

Buck gives you this.....



Dead true precision . . . .0005" precision chucking duplicate parts . . . ends need for collets . . . holds O.D. and I.D. true . . . takes up wear . . . compensates for spindle run-out . . . and there's NO PRICE PREMIUM!

If you haven't yet put Buck Ajust-Tru® chucks to work in your plant there are big and profitable performance surprises ahead. Send for complete information. "It pays to chuck with Buck."

Makers of Scroll, Power, Dust Proof, Independent Chucks.

BUCK TOOL COMPANY

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CIRCLE 569 READER SERVICE CARD

The modern metalworking fact you want—when you want it!

THE NEW

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Edited by Rupert Le Grand, Senior Associate Editor, **American Machinist/Metalworking Manufacturing.** 45 big sections. 80% rewritten. 1579 pages, 774 illustrations, $13.00. See this big practical guide 10 days FREE. Pay on easy terms if you keep it. Send coupon now.

Famous handbook, now completely revised, answers hundreds of machine shop and drafting room questions—layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances, forming, finishing, etc.

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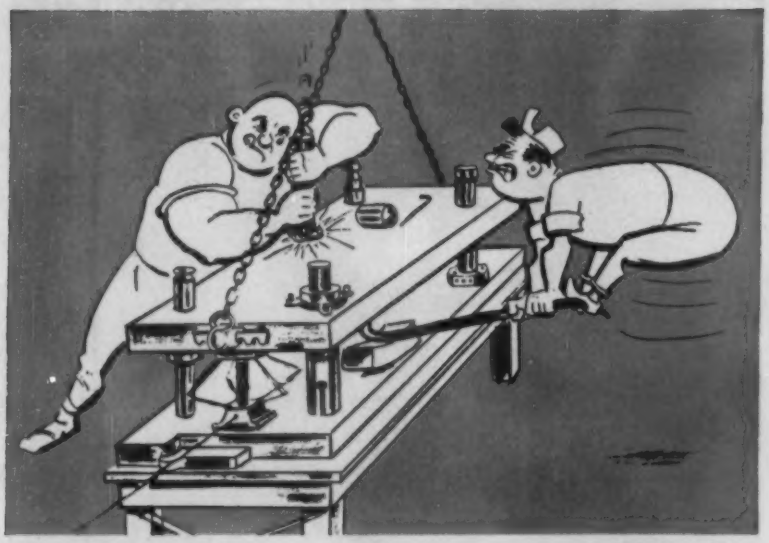
DON'T KNOCK YOURSELF OUT WITH STICKY DIE SETS!



Dieco Ball Bearing Die Sets take all the strain out of die making!

NO PAIN...NO STRAIN...and it is extremely accurate! These precision die sets give you burr-free parts and longer production runs – thanks to their "negative clearance." (Cutaway shows how ball-bearing bushing rides on the pin.)

Try a Dieco ball-bearing die set on that next job; you will actually see the punch holder g-l-i-d-e on and off. Folks tell us working with Dieco is almost like taking a two-week vacation. It's that easy.

Management likes them, too. The pre-loaded bushing eliminates die shifting, protects the dies, and gives longer runs between grinds. These sets are assembled in the conventional way; pins are in the shoes. We will sell you complete sets, or just the components, so you can convert the friction bushing sets you now have.

dieco DIE SETS

E. W. BLISS COMPANY
DIE SUPPLY DIVISION
1400 Brookpark Road
Cleveland, Ohio

CIRCLE 570 READER SERVICE CARD

EQUIPMENT FOR THE MODERN SHOP

. . . as seen by the editors of AM/MM

Two scale model forecasts of tomorrow's metalworking shops will be on display in the AM/MM booth at the Chicago Machine Tool Exposition. Examine them and take away floor plans and equipment lists of tomorrow's metalworking shop layouts.

BOOTH 1548 — UPPER NORTH HALL
International Amphitheater

NEW BOOKS . . .

PRODUCT STANDARDS FOR DIE CASTINGS—*Published by American Die Casting Institute, 366 Madison Ave, New York 17, NY.*

Three new engineering product standards on die cast threads; fillets, ribs, and corners; and lettering and ornamentation have been added to ADCI's Engineering (E) Series of Standards. ADCI has also published a Metallurgical (M) Series and a Commercial (C) Series.

With issuance of the three latest standards, the E Series totals 24 pages and covers all of the following subjects: linear dimension tolerances; parting line tolerances; moving die part tolerances; draft requirements for walls; flatness tolerances; depth of cored holes; draft requirements in cored holes; cored holes for tapping; ejector pin marks; flash removal; angularity tolerances; concentricity tolerances; machining stock allowance; die cast threads; fillets, ribs, and corners; lettering and ornamentation.

•

DIMENSIONAL STANDARDS FOR SEMI-TUBULAR RIVETS — *Published by the Tubular and Split Rivet Council, 53 Park Pl, New York 7, NY. No charge.*

Guide contains standard data on all major classes of semi-tubular rivets. Includes for the first time, in chart form, such information as body and head diameters, head thicknesses and radii, and hole diameter and depth figures.

(Continued on p598)

"Things like this make a fellow realize the value of safety shoes."

The magic of our ingredients makes electric motors better...

Just as a good chef wouldn't use only one all-purpose spice to make a specialty...we don't make an electric motor with one all-purpose insulation.

We build motors with SELECTIVE INSULATIONS...

SELECTIVE INSULATIONS are the magic ingredients that make the difference between merely good motors—and the famous dependability, low maintenance, uninterrupted productivity, and prolonged service of Fairbanks-Morse electric motors.

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SELECTIVE INSULATIONS meet emergency overloads, temperature extremes, corrosive atmospheres.

We select, test, treat, and prepare insulating materials for the motor... and the job.

We build electric motors that are insulated, rated, and dimensioned to furnish unfailing power—for any purpose.

The magic of our ingredients makes a Fairbanks-Morse electric motor better... and a better buy.

WHAT DO YOU NEED IN A MOTOR?

1 h.p. to 10,000 h.p.... open or weather-protected ... vertical or horizontal ... synchronous or induction ... AC or DC ... we'll build it—and build it to last! Write: Fairbanks, Morse & Co., Freeport, Illinois, for full information.

Fairbanks, Morse

ELECTRICAL DIVISION

A MAJOR INDUSTRIAL COMPONENT OF
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HY-PRO

Co-form® X-PRESS® TAPS

Manufactured under license from Besly-Welles Corporation

for tapping threads without cutting

NOW — from HY-PRO you can get the newest in tap design — Co-form X-Press fluteless taps that are setting cost-reduction records on many jobs that were formerly "tap-killers".

HY-PRO Co-form X-Press taps cold-form threads in through or blind holes, with these advantages . . .

No Chips to clog and cause tap breakage — no chip removal problems • **Permit Faster Tapping Speed** and boost production from automatic equipment **Provide Accurate Control** of hole size — cannot be forced into lead error • **Eliminate Blind Hole Tapping Problems** — no chips to jam at bottom • **Form Stronger Threads** with better holding power • **Taps Are Stronger** without flutes, especially in smaller sizes **Taps Last Longer** and maintain accurate size tolerance **More Holes Per Tap** — up to 40 times greater tap life.

Tap for less with Co-form® X-Press®

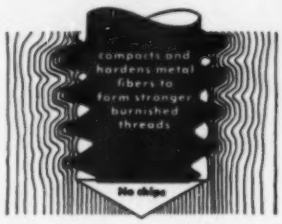
®X-Press is a registered trademark of Besly-Welles Corporation. ®Co-form is a registered trademark of Hy-Pro Tool Company.

Recommended for tapping . . .

Copper Brass Lead
Aluminum Zinc
Steel Magnesium
Die Castings
Leaded Steel
Stainless Steel
— other ductile metals

Tapping operation is the same

Conventional methods and equipment are used, except for change to larger tap drill sizes.



HY-PRO

STANDARD TAPS FROM STOCK

for "most holes per tap" – in any material

Hand and Machine Screw | Spiral Point | Fluteless Spiral Point | Spiral Flute | Special Application | Pulley | Acme | Taper Pipe Spiral Flute | Taper Pipe Straight Flute

Hy-pro Tap Engineering Specialists will help you find out quickly how much you score on "cost per tapped hole." Their job analysis regularly leads to savings of 50% or more — often with a simple switch to the right style of standard taps. Write for complete information. Find out how much you can save.

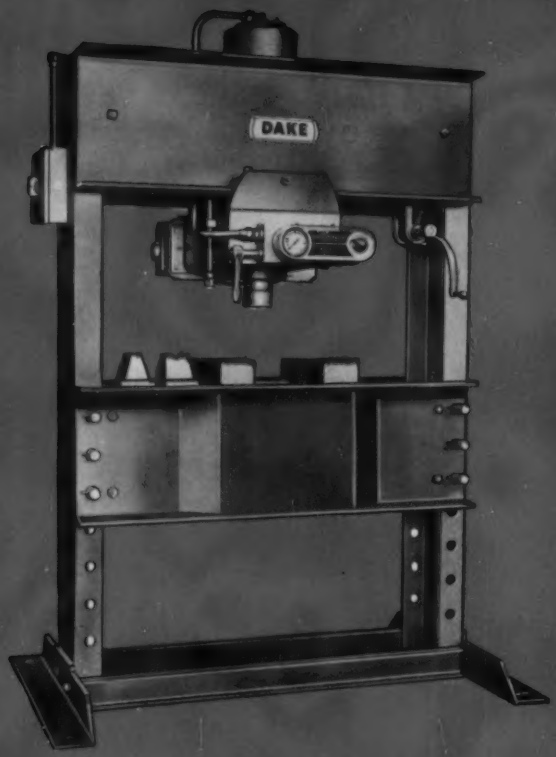
For standard taps from stock, call your local **Hy-pro Tap Distributor.**

HY-PRO TOOL COMPANY

NEW BEDFORD, MASS., U. S. A.

DAKE

PRESSES FROM 1 TO 600 TONS

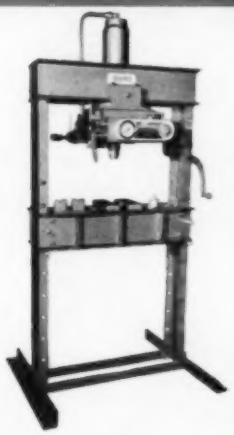


The most complete line of standard and custom engineered presses for industrial application.

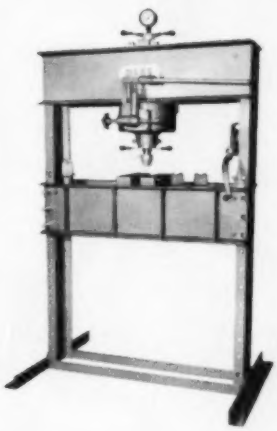
STANDARD MODEL PRESSES

Rugged construction, with power to spare, plus amazing versatility are combined in DAKE presses to handle tough jobs smoothly and keep your press operations in step with your production tempo. Standard models available in capacities of 1 to 150 tons.

DAKE ELEC-DRAULIC PRESSES are ideally used where speed and ease of operation are required. Top performance is assured through these outstanding features. RAPID RAM APPROACH — VARIABLE RAM SPEED — MOVABLE SELF CONTAINED HYDRAULIC WORKHEAD. Four models available from 25 to 150 tons capacity.

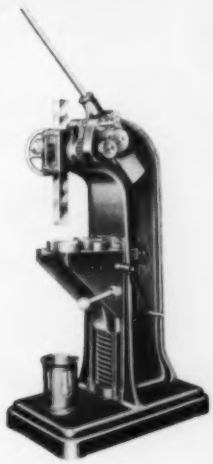


DAKE Air Operated Hydraulic Presses feature Rapid Ram Approach — Movable Self Contained Hydraulic Workhead — Fingertip Control. These presses are the popular choice for machine shop, tool and die shops, truck repair shops as well as general industrial plants. Sixteen models available from 25 to 150, tons capacity.



DAKE Hand Operated Hydraulic Presses are particularly suited for general shop work where occasional pressing jobs are required. Five models available from 25 to 150, tons capacity.

DAKE Single Leverage Arbor Presses are particularly designed for light production and assembly work. Ten models are available in capacities ranging from 1 to 5 tons. The ratchet type models are particularly popular for maintenance work.



DAKE Compound Leverage Arbor Presses are designed to permit the operator to apply great pressures with minimum effort. There are 7 models available ranging from 6 to 25 tons capacity.

DAKE PRESSES

DAKE CORPORATION

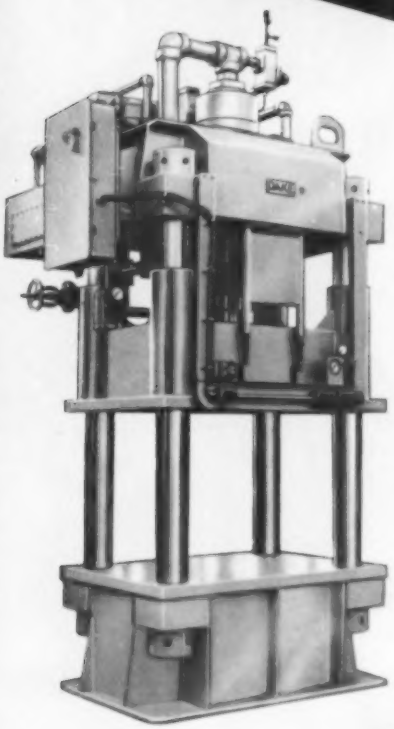
636 ROBBINS ROAD, GRAND HAVEN, MICHIGAN

DAKE

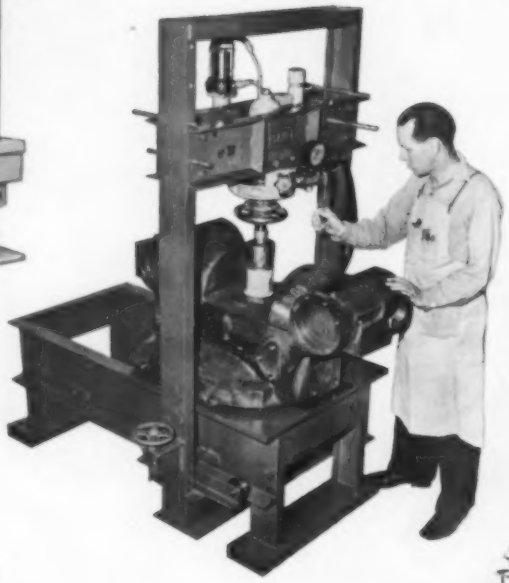
CUSTOM ENGINEERED PRESSES

Although many press problems can be handled by one of the many stock model Dake Presses, for special applications, Dake is equipped to design and build custom engineered presses.

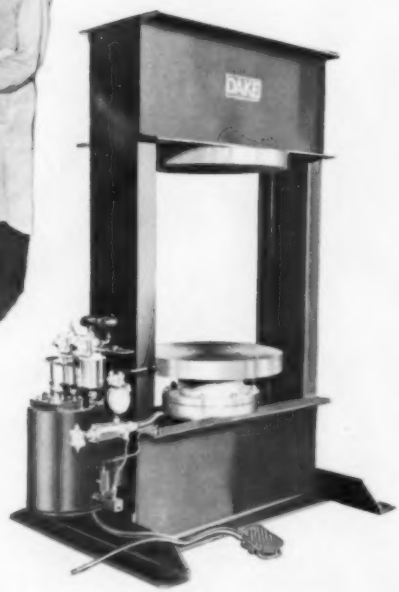
If you have a special problem related to type of press needed, tonnage requirements, dimensions, available power, speeds, stroke or type of control, let us know about it. We'll put Dake engineering know-how to work for you.



MODEL 27-106 Guided Platen Presses are used extensively in plastic molding, metal forming, and die try-out work. In addition to standard sizes, specifications can be varied to meet customer requirements.



MODEL 19-220—25-ton hydraulic movable frame Press. The roller mounted traveling frame makes it easy to press large, heavy, hard-to-handle parts.



MODEL 33-101—125-ton air operated hydraulic Tire Presses are designed for use in pressing hard rubber tires on and off rims.

SEE US IN BOOTH 211

At The Production Engineering Show, Navy Pier, Chicago, September 6 - 16.

Write for catalog and complete details

DAKE PRESSES

DAKE CORPORATION

636 ROBBINS ROAD, GRAND HAVEN, MICHIGAN

let ultrasonics help you

CUT COSTS WITH KNOWLEDGE

Ultrasonics, properly applied, gives you the **facts** about work in progress, instantly and accurately . . . **cleans** parts quickly and perfectly. When you **know** that a part is sound and dimensionally accurate, when you **know** that it is clean, you work with confidence that rejection or failure won't add delays and non productive costs.

Branson ultrasonic equipment embodies nearly a decade and a half of active experience in industrial ultrasonics. It is engineered for its job, backed by a nationwide network of experienced specialists.

SONORAY® pulsed Ultrasonic Flaw Detectors probe every kind and shape of metal — find voids in **castings,** laminations in bonded **sheets,** cracks in **rods,** inclusions in **welds** — in fact practically any discontinuity large enough to be of interest. They work quickly, accurately, nondestructively, in every recognized pulse-inspection technique. **Bulletin T-200.**

VIDIGAGE® Ultrasonic-resonance Thickness Gages check dimensions of work-in-progress ±1% and closer — extrusions, milled parts, tubing, plates, castings. Its utility is extended by gating circuits, continuous recorders, extension cables up to 1000 feet, and other accessories. Direct-reading screens on CR tubes of both 14" and 21" models. **Bulletin V-200.**

AUDIGAGE® portable self-powered Ultrasonic-resonance Thickness Gages supplement the VIDIGAGE® for field work where accuracies of 1-to-3% are adequate. Standard Model 5 and new miniaturized Model 6 are described in **Bulletin A-200.**

SONOGEN® Ultrasonic Cleaning Systems range from integrated half-gallon benchtop models to multi-cabinet systems and the largest engineered installations for continuous cleaning of wire and strip at mill speeds. Miniature ball bearings, complex castings, precision machinings, radiation-contaminated equipment, are micro-cleaned at a fraction of the cost and time of even the best older methods. State your problem in detail when writing for information.

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Since 1946 — The Respected Name in Ultrasonics

The experience of many Branson men throughout the world is at your disposal in building quality and cutting costs. Call on us for engineering help in the selection, installation, use and maintenance of **exactly** the right equipment for **your** needs.

You can readily attach this OPTICAL PROJECTOR to most machine tools

- Opens a whole new dimension in precision production!
- Operator sees the work magnified while in process!
- Improves quality, increases productivity, eliminates transfer errors, simplifies operator training!

A versatile attachment for improving efficiency of these machine tools:

Brown & Sharpe
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Reid
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Royal Oak
U. S. Mill
Thompson
K. O. Lee
Boyar-Schultz

. . . or almost any lathe, grinder, miller or shaper

Operator sees piece magnified while he is working it . . . not afterward when it may be too late. He can measure and check it against transparent overlay charts. Improves quality and tremendously simplifies close tolerance work. Speeds up production. Cuts down errors and costly scrap. Allows you to do work you might not otherwise be able to handle.

Model 7M Machine Tool Optical Projector. Standard magnifications from 10X to 100X. Measures in increments of .001" or .0001".

STOCKER & YALE

Optical Projection Equipment — Lite-Mite Supplementary Lighting

Want Details? ☐ Demonstration ☐ Optical Projection Methods Engineering ☐ Catalog on Machine Tool Projector Model 7M

Clip and attach to your letterhead. Sign and mail to:
STOCKER & YALE, INC., 48 Green Street, Marblehead, Mass.

CIRCLE 575 READER SERVICE CARD

MODERN METALWORKING IN MINIATURE

. . . at the 1960 Chicago Exposition

For an intriguing look at tomorrow's metalworking shops (with equipment available today) be sure to visit the American Machinist/Metalworking Manufacturing booth at the 1960 Machine Tool Exposition.

BOOTH 1548 — UPPER NORTH HALL
International Amphitheater — September 6-16

NEW BOOKS

STEEL CONVEYOR PULLEY STANDARD—*Published by the Multiple V-Belt Drive & Mechanical Power Transmission Association, 27 East Monroe St, Chicago 3, Ill. Price, $1.*

Titled "Welded Steel Conveyor Pulleys — Recommended Load Ratings for Standard Pulleys," the new standard includes a tabulation of load ratings applicable to standard welded steel conveyor pulleys; a list of the pulley diameters considered standard for the industry; and a list of pulley face widths which are standard for the industry. Several pages of data helpful to the engineer in selection of the proper pulleys are included. This is the first standard issued on welded steel conveyor pulleys and it offers a basis for efficient and economical pulley selection.

•

CALIBRATION OF LINE STANDARDS OF LENGTH AND MEASURING TAPES AT THE NATIONAL BUREAU OF STANDARDS, *by L V Judson. Order from Supt of Documents, US Government Printing Office, Washington 25, DC. 12 p. Price 15¢.*

NBS Monograph 15, which replaces NBS Circulars 332, 328, and 572, is issued as a guide for anyone contemplating the submission of such items to the Bureau for Standardization and includes an outline of the calibration methods used at NBS. Equipment used is described briefly. Includes discussion of some consid-

"But, Mother, Fred is working. He had a line run from the factory so he could do his work at home."

(Advertisement)

The Day Maximation Began

In seeking ways to increase efficiency, production men in the metalworking industry have found elimination of hidden machine tool costs through the use of proper filtration equipment a virtual guarantee of maximum output and economy. This method of obtaining increased production rates is known as *maximation*. Although today, it is one of the most significant factors in determining metalworking profit ratios, the maximation theory and its initial applications were actually developed more than 20 years ago.

HOW MAXIMATION STARTED

A number of months after inspection and delivery of several thousand piston rings to an airplane engine plant, the manufacturer was told that the rings were unsatisfactory and would be returned. Metal particles in the coolant apparently had adhered to the rings during the lapping process and the original high polish finish on the inside of the rings was pitted and chipped on removal from storage. About this time, engineers from the U. S. Hoffman Machinery Corp. were pioneering in research and development of dry cleaning principles for the removal of metal from kerosene coolants. Asked to provide a solution to the problem, they designed a pressure filter system for the clarification of coolants.

THEN AND NOW

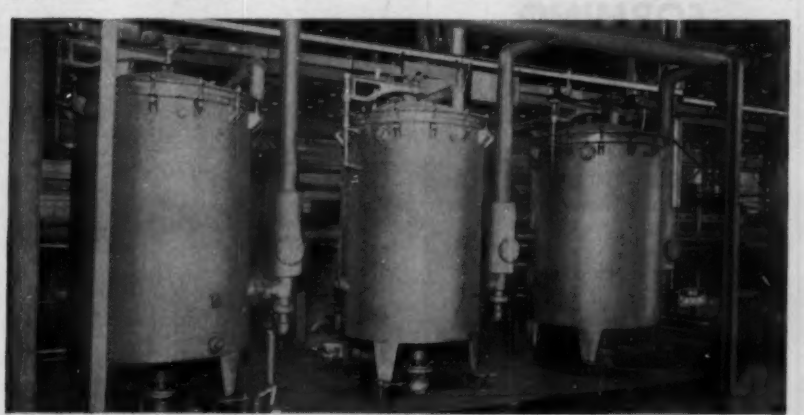
This first filtration equipment by Hoffman was a fantastic complex of pipes and valves. But it did a fine job of bringing clean coolant to the work. A few months later, Fafnir Bearing asked for 2 pressure filters "just like the original." From these pioneering concepts have come Hoffman's modern equipment. Today, Fafnir Bearing employs more than a dozen advanced Hoffman individual and central filtration systems.

At Fafnir and in thousands of other plants employing filtration, coolants and lubricants once contaminated by metallic chips, abrasives and other extraneous dirt are no longer responsible for high production, maintenance and costs, as well as premature obsolesence. Through proper filtration, machines originally designed and tested for peak efficiency with clean lubricating oil and clean coolants can now operate at or near rated capacity. Filtration has made it possible to obtain a 30 to 50% savings in grinding wheels, honing stones, broaches, cutting and other edge tools in addition to providing numerous collateral benefits and advantages.

TYPES OF FILTRATION EQUIPMENT

In making recommendations for solving filtration problems, Hoffman engineers draw on a complete line of equipment which includes;

PRESSURE FILTERS—This type of filter gives up to 100% clarity and is widely used with grinding, cutting and honing oils as well as water soluble oil coolants where finest clarity is consistently required. Easily adapted for large groups of machines. Unlimited coolant capacity.



View of a central pressure filter system at the Plymouth Mound Road Engine Plant of the Chrysler Corp. This system serves a wet grinding department.

FLOTATION EQUIPMENT—Automatic flotation units increase the productivity of machine tools and eliminate down time for sump cleaning. Provide excellent results in steel and cast iron applications with efficiencies of over 98% in one pass. Handles flow rates from 40 to 1500 gpm.

MAGNAFLOW SEPARATORS—Fully automatic and self-cleaning, Hoffman Magnaflo Separators remove from 75% to 90% ferrous solids from cutting oils and water soluble coolants. Flow rate from 40 to 1,000 gpm.

VACU-MATIC FILTERS — For continuous filtering of coolants from *individual* machine tools. Provides unusually high flow rates in continuous filtration of water soluble coolants. Completely automatic and self cleaning. Flow rates range from 40 to 2,500 gpm.

DISC FILTERS — Filter oils containing finely divided particles. Geared for continuous flow.

SUCTION FILTERS—Provide fine filtration on small flow rates for lapping, microhoning, grinding and similar operations. Cap.5-60 gpm.

SUMMING UP

Proper filtration delivering clean coolant makes it possible to achieve maximation with these savings.

- Greatly reduced down time
- Higher speeds
- Improved finishes—fewer rejects
- Longer useful life of coolants
- Life of edge tools extended
- More sustained tolerances
- Fewer stoppages, adjustments
- Scrap loss considerably reduced
- Elimination of motor pumps
- Curtails bacteria and rancidity
- Saves 25 to 50% in grinding wheels, honing stones, broaches, individual machine tools.

To check on the unlimited industrial applications of individual tool and complete central filtration systems, send for free bulletins and case histories on equipment described above.

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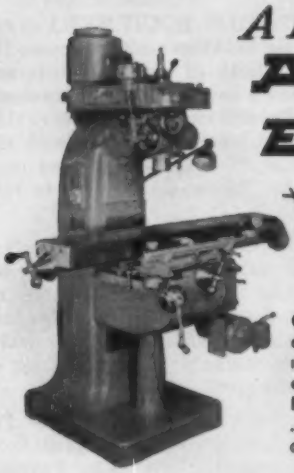

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● 1½ HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

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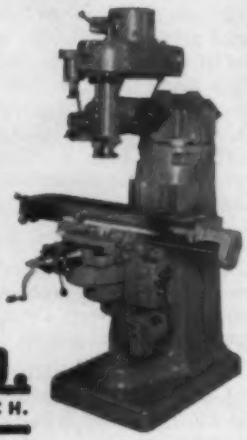

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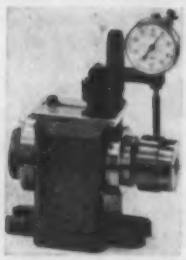

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NEW BOOKS . . .

erations that should be given as to whether or not a standard should be submitted to the Bureau for calibration, and instructions are given on how to submit such standards. Appendix contains useful information on use of steel tapes.

NEW FILMS...

OLD AS THE HILLS. *Produced by Norton Co, Worcester 6, Mass. 16mm, sound, color. Running time 28 min. No charge.*

Produced as part of Norton's 75th anniversary celebration, this unusual new film tells the story of abrasion; first as practiced by nature long before man came on the scene, then as practiced by man to shape his own environment. From the natural sandstones used to sharpen swords and polish armor, to the controlled, man-made abrasives of modern industry, the story is told step by step. The natural forces of prehistoric times are demonstrated by scenes of the New England landscape, and early uses of natural abrasives are illustrated by scenes of 18th century life taken at famous Old Sturbridge Village. After the War between the States, comes the invention of the vitrified grinding wheel at the old Norton pottery in Worcester. Shown also are the mining of bauxite—the raw material for abrasives and refractories—and the effects of applied abrasive technology on industrial and home life.

Although designed for non-technical audiences, such as schools, social and business organizations, and

"Yes, we encourage 'on the job training', Higgins, but Miss Lamont has been here for two years!"

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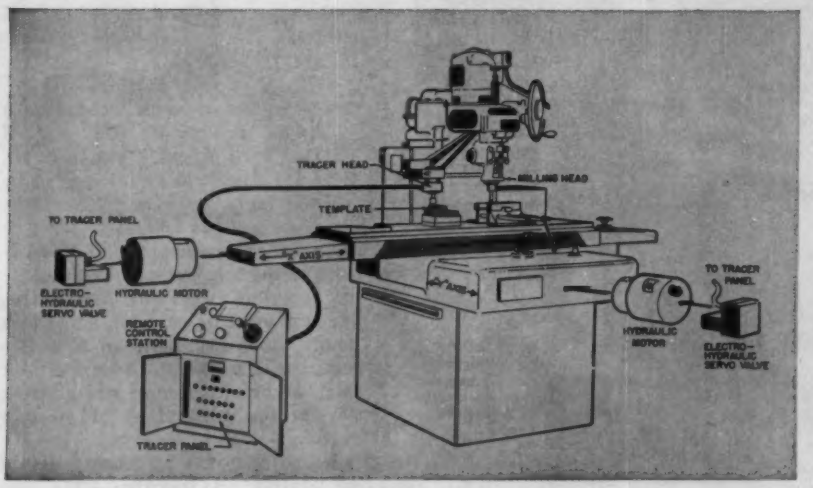
machine control . . .

Honeywell's new Electro-Hydraulic Servo Systems and Components



360° electro hydraulic tracer control system

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Speed control systems—speed ranges of 1000 to 1, speed regulation to 0.1%, and consistent speeds to 1 rpm are possible with electro-hydraulic speed control.

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Speed and position—synchronization and programming—control of tension, force, level, torque, etc.

For further information on Honeywell's new machine control systems and components, and their application to your specific job, call your nearest Honeywell office. Or write: Minneapolis-Honeywell, Department AM-8-12, Minneapolis 8, Minnesota.

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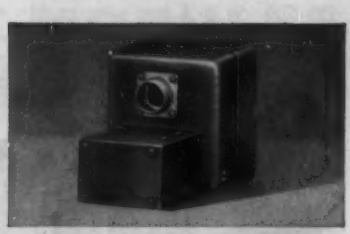
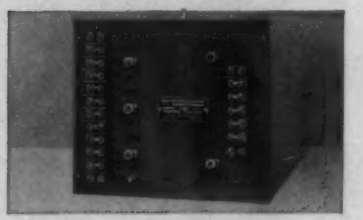
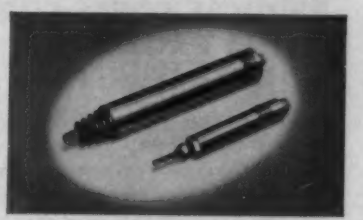


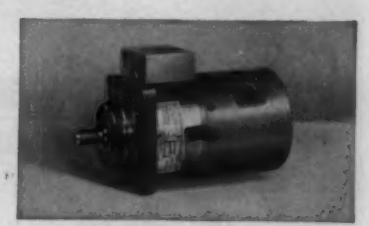
Electro-hydraulic servo valves—2-, 3- and 4-way valves with output flow proportional to input signal. Designed specifically for industrial use.



Transistorized servo amplifiers—proportional and integrating low voltage amplifiers designed for servo systems, incorporating servo valves, d-c relay and servo motors.



Feedback transducers—industrialized linear and rotary transducers providing accurate sensing and feedback for servo loops.



Hydraulic motors—roll-vane motors producing high torques at low speeds. Often connected directly to load. Integral tachometer optional.

Servo accessories—input commands, meters, manifolds, phase conversion panels, consoles, etc., to complement the servo control systems.

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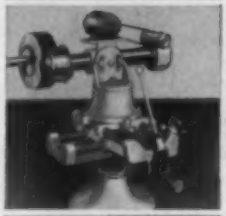
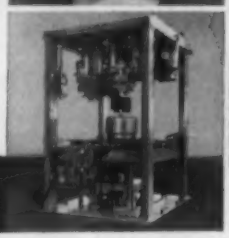


HAN-D-MATIC— low cost machine with interchangeable components for buffing, grinding, and deburring.



WIRE BRUSH MACHINE— deburrs automatic washer and dryer basket holes prior to painting.

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employee groups, the film will still be found highly acceptable and interesting even to those with a solid background knowledge of abrasives.

•

AUTOMATIC DRILL POINT GRINDER. *Produced by Winslow Product Engineering Corp, 47 St Joseph St, Arcadia, Calif. 16mm, sound, color. Running time 10 min.*

This film shows the Model 100 Winslo-Matic in operation, producing various types of points on drills ranging from 1/32 to 1.5 in. at high production rates and with extreme precision.

•

THE AUTO-COLLIMATOR. *Produced by Engis Equipment Co, 431 S Dearborn Street, Chicago 5, Ill. Film strip and recording. Running time 22 min. No charge.*

To explain principles and applications of the Microptic Auto-Collimator, this film shows how light beams are employed to establish and check points, lines or planes in space, to less than a millionth of an inch per inch, to obtain precise straightness, parallelism, inclination or circular spacing.

Because of the increasing use of collimators in industry, this film should be extremely useful to groups in industry, education and technical societies. A 12" record is supplied with the film, together with a mimeographed copy of the text and a supply of basic reference material for free distribution to the audience.

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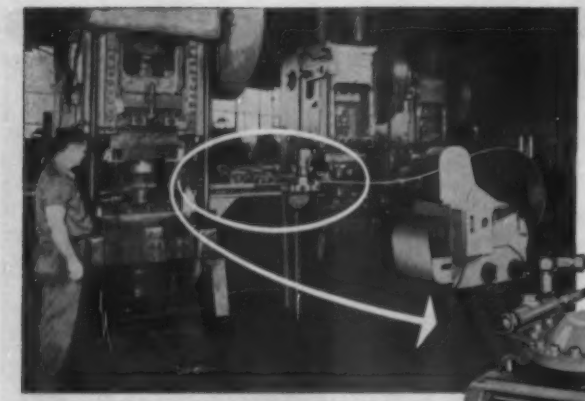
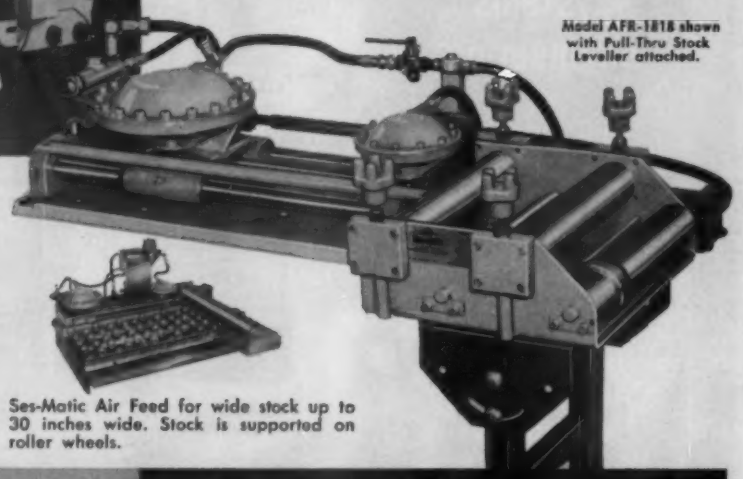


• The Ses-Matic "SPACE-SAVER" Line featuring the Ses-Matic Air Feed, Pull-Thru Stock Leveller and Coil Cradle.



Model AFR-1818 shown with Pull-Thru Stock Leveller attached.

Ses-Matic Double Air Feed for materials up to 72 inches wide. This unit feeds stock 72" wide by .074 thick and removes coil bend with a Pull-Thru Leveller.

Ses-Matic Air Feed for wide stock up to 30 inches wide. Stock is supported on roller wheels.

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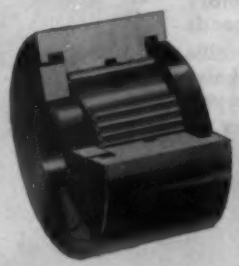

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Write for Catalog No. 52-A for full information on McGill's needle roller bearings, and cam followers. Ask about recommendations for high precision special ball and roller bearings.

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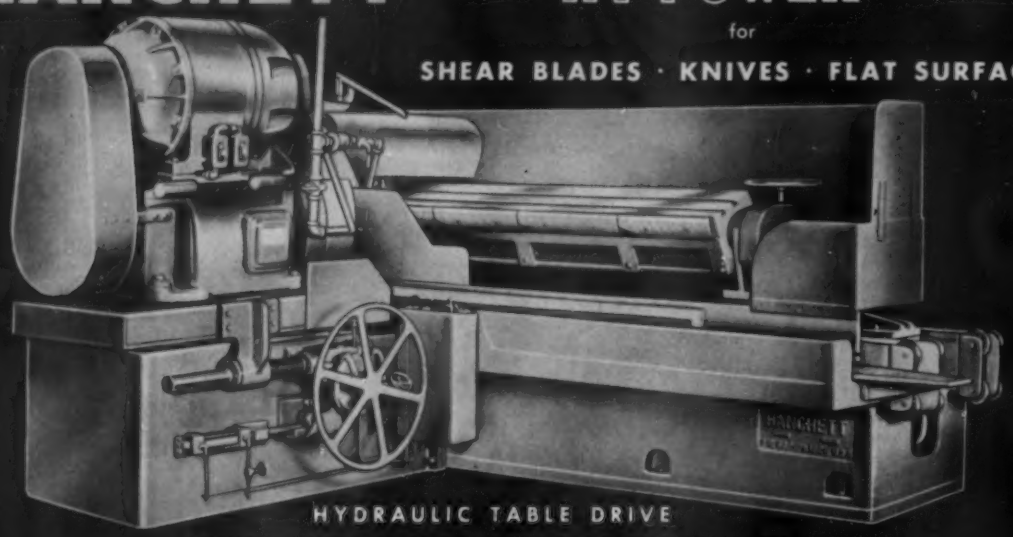

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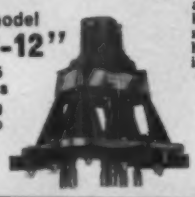

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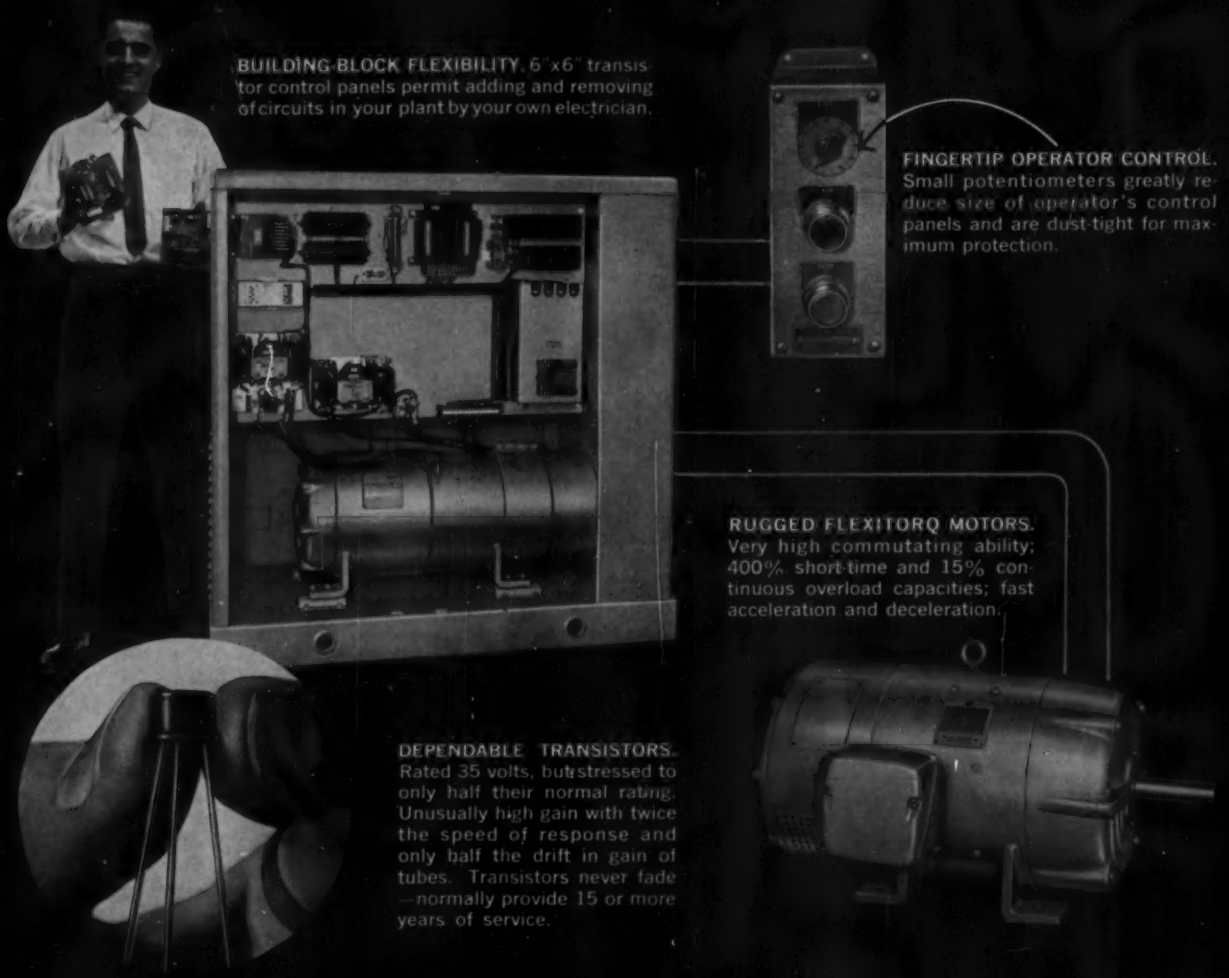
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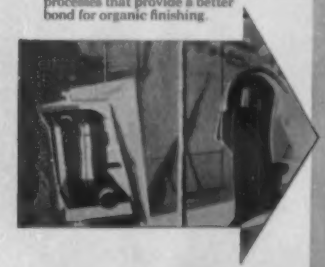
HERE'S HOW PAINTITE SCORES ON SURVEY'S 12 "MOST WANTED" FEATURES...

Formulated as Result of Industry-Wide Survey...

During the first six months of 1959, Turco undertook an extensive survey of the phosphate coating market. Hundreds of users of these coatings were interviewed. Thousands of questions were asked. When the answers were tabulated, Turco began the task of building an iron phosphate process to the *exact specifications* called out in the survey.

The new process is now available. It is called Turco Paintite. Paintite has been thoroughly field-tested in the production lines of a dozen Turco customers. It has passed the most severe tests with flying colors. Turco is proud to announce the addition of Paintite to its ten other Turcoat phosphate and conversion coating processes that provide a better bond for organic finishing.



1. **SUPERIOR CLEANING**–Exclusive wetting system provides heavy-duty uniform cleaning. Cleans & phosphates simultaneously.
2. **TEMPERATURE VERSATILITY**–Efficient anywhere within range of 140° to 180° F. Temperature control is not important.
3. **LOW FOAMING** – at any temperature within recommended range.
4. **LESS POST RUST**–Eliminates post rusting problem often encountered with iron phosphate processes.
5. **NO WHITE STREAKING**–Extra free rinsing. Leaves no residue.
6. **ECONOMICAL**–Low in initial cost. Low in maintenance cost. Low in cost per sq. ft. Long-lived, even under mass production use.
7. **UNIFORM COATING**–even on edges and points. Won't show through on low-pigmented paints.
8. **USE VERSATILITY**–used by immersion, spray washer or steam cleaner.
9. **LESS SLUDGE** – less scale. Minimizes clean-up problems.
10. **RESERVE ACIDITY**–combats alkaline water conditions. Constant control not necessary.
11. **SUPERIOR SERVICE**–by Turco's vast network of technically trained servicemen, located in industrial centers throughout the world.
12. **REQUIRES ONLY 3 STAGES**–for dip or spray washing. Can be efficiently used in 5-stage operations, if desired.

FREE! VALUABLE BOOKLET – PHOSPHATING REFERENCE CHART – TECHNICAL DATA BULLETIN

Get the full story on Paintite and the other ten phosphating and conversion coating processes in the complete Turcoat line. Write for your copy, along with Turco's Phosphating Reference Chart, today!

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Please send valuable booklet with Phosphating Reference Chart and full details on Paintite. I understand there is no cost or obligation on my part.
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TITLE

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For complete information on the special tool design services of Woodruff & Stokes, write to:

WOODRUFF & STOKES CO.
INCORPORATED
Bldg. 32, 353 Lincoln Street, Hingham, Massachusetts

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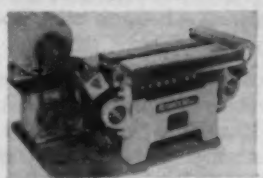
AUTOMATIC MACHINERY BUILDERS SINCE 1946

AUTOMATIC MILL

Precision Machine 3,000 Parts Per hr !



New BAIRD machine automatically mills rugged tool blanks or small electronic parts at high speeds with accuracy duplicated to ± .001".

AUTOMATIC MILL INCORPORATED
Danbury Industrial Park, Danbury, Conn.

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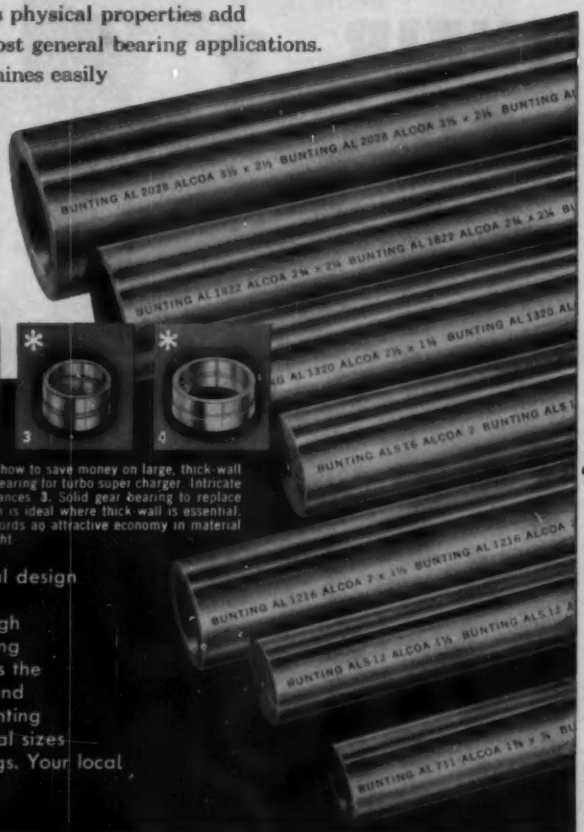
BUNTING AL 2028 ALCOA 3½ x 2½ BUNTING AL 2028 ALCOA 3½ x 2½
BUNTING AL 1822 ALCOA 2¼ x 2¼
BUNTING AL 1320 ALCOA 2½ x 1¼ BUNTING AL 1320
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case in point*

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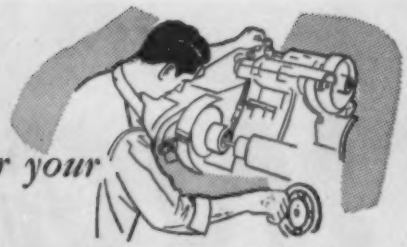

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MONITOR THEIR PRODUCTION

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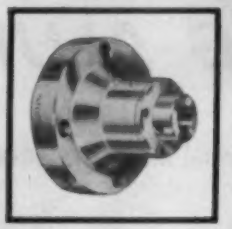

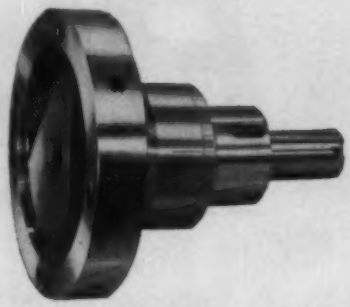

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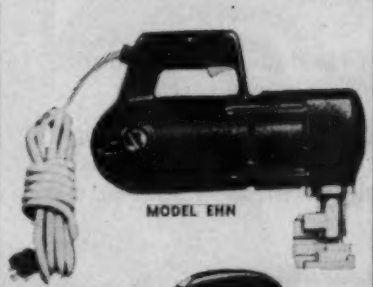
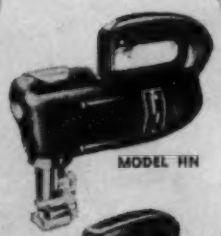
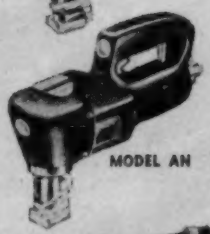
No matter the kind of metal or shape to be cut, FENWAY NIBBLERS (air powered or electric) operate with a cutting action which displaces the metal without distortion on both sides of the sheet: insures finished smooth edge, no chipping, no binding, no curling, no flaking . . . Cuts inside circles, squares, odd shaped holes on a per job or production line basis—save time and materials in every application . . . Portable, light in weight, (8-20 pounds depending on model)—safe, easy to handle, proved durable in critical operations, minimum maintenance, guaranteed unconditionally.


MODEL EHN


MODEL HN


MODEL AN

MODELS MN AND LN

MODEL MNC

NEW ¼" NIBBLER
Heavy duty Nibbler cuts through ¼" cold or hot rolled steel plus 5/16" aluminum—also cuts 8 gauge stainless.

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Heavy duty Nibbler cuts 10 gauge stainless steel or 8 gauge mild steel.
WT. 13 lb.

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Lightweight 12 lb. tool cuts up to 3/16" of copper, brass, aluminum, 10 gauge stainless, 8 gauge stainless

MODELS MN AND LN
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*THE FENWAY NIBBLER CUTS: all non-ferrous metals, copper, brass, aluminum etc., 10 gauge or 8 gauge stainless steel, tough pitch or asbestos coated corrugated steel, ¼" cold or hot rolled steel and 5/16" aluminum . . . . all models guaranteed against defects in materials or workmanship.

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BOOTH 437—SEPT. 6-16, PRODUCTION ENGINEERING SHOW

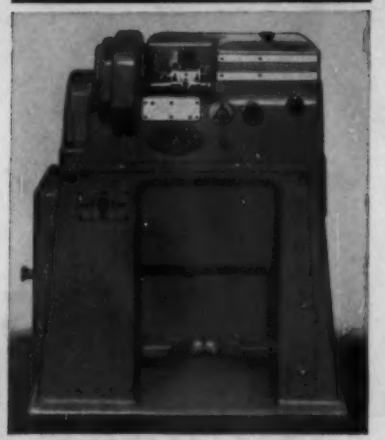
YOU *save money* by threading with CRI-DAN

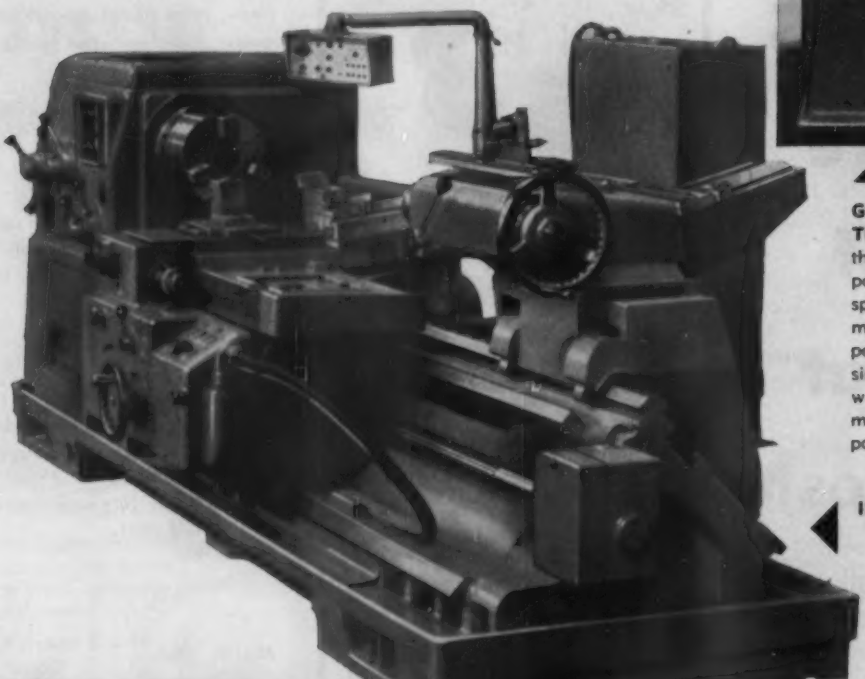
SEE for yourself the advantages CRI-DAN offers:

- Low Tooling Cost — single-point carbide tool eliminates costly taps, dies, thread milling cutters and thread grinding wheels;
- Speed — dramatic time savings through fast automatic cycle and fast, simple setup;
- Precision — all types of work and materials — single- and multiple-start, coarse or fine, straight or tapered, left- or right-hand, internal or external — right up to shoulders.

GISHOLT BOOTH 518

second coliseum machinery show





GISHOLT CRI-DAN A Threading Lathe — for threading small precision parts at peak production speeds. The carbide tool makes up to 150 passes per minute! The operator simply loads and unloads work, controlling the machine from a sitting position.

INTRODUCING—the GISHOLT CRI-DAN FT-80 Threading and Turning Lathe

For the first time see one machine perform threading, turning, facing, boring, tracing and cut-off, using single-point carbide tools throughout, in one fast automatic cycle.

GISHOLT CRI-DAN B Threading Lathe — demonstrates 15-minute setup; threading and tracing of high-tensile bolts and related parts; versatility for all types of work and materials at production rates far above those possible with thread milling or thread grinding.

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TOOL NEWS

★ ***Since 1957, applied in 20,000 special boring, facing, turning, milling and chamfering tools***

★ ***Simplifies combining of operations***

WESSON Standardized Cartridge System Revolutionizes Special Tool Field

This little cartridge is the simple answer to thousands of special tool needs.

In only 3 years, the Wesson adjustable cartridge tooling system has revolutionized the design of thousands of multiple point tools for boring, milling, chamfering, turning and facing. (For examples, turn the page.)

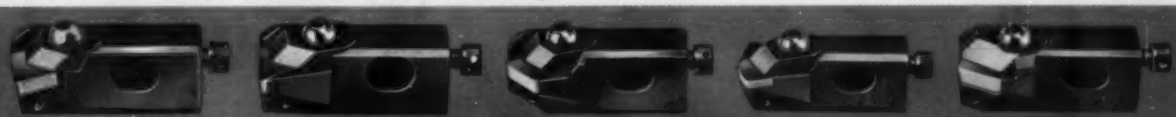
The standard 5 styles shown below, alone, cover the vast majority of all special multi-point tool requirements resulting in minimum inventory cost, minimum tool design and fabricating cost. From 2 to 18 or more operations may be combined in a single tool with the Wesson cartridges. Adjustable in two directions, the cartridges with their throw-away inserts cut down-time for setup and tool changes. They come in 5 styles (for square, triangular or pentagonal inserts) and in left and right hand types.

The same cartridge can be used for machining different materials simply by switching to the required Wessonmetal grade. When a tool is no longer needed, cartridges can be switched to other uses. Damaged cartridges can be quickly replaced from stock, avoid high special tool replacement cost.

You can often use special tools for different size parts by simply adjusting the cartridges. Designed to provide maximum chip clearance and to protect the cutter body, cartridges are rigidly retained in the body.

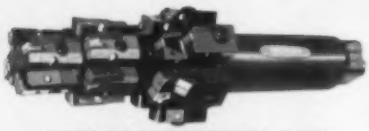
Get our latest bulletin (C-660) on these standardized cartridges by circling A-2 on the Readers' Service Card. Circle A-1 and our representative in your area will show you numerous illustrations of some of the 20,000 different special tools in which these cartridges have proven themselves.

Please turn the page . . .



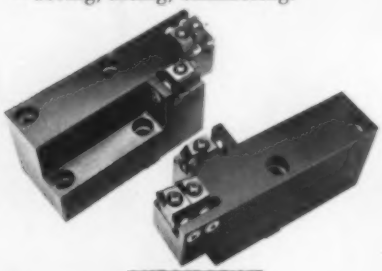
These 5 cartridges will take care of almost all special tools.

Some of the many specials using WESSON cartridges



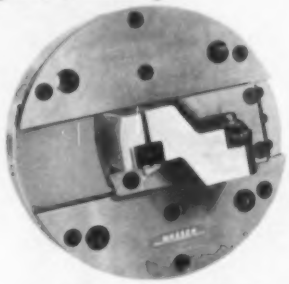
AUTO TRANSMISSION CASE

15 different operations with one tool —boring, facing, chamfering.



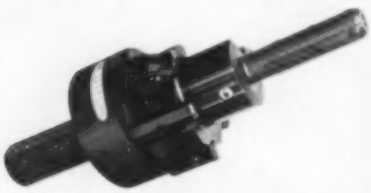
AUTOMOTIVE

Simple tool block for multiple turning and chamfering.



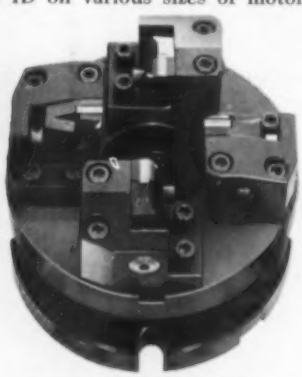
HYDRAULIC VALVES

Interchangeable preset blocks and cartridges face ends of all valve sizes.



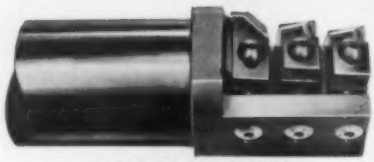
ELECTRIC MOTORS

Bores and faces all bearings, chamfers OD, ID on various sizes of motors.



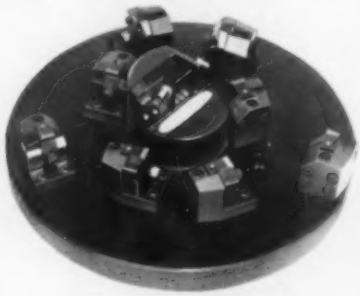
STEERING ASSEMBLIES

Hollow mill turns ends of control arm shafts.



AIRCRAFT ENGINES

Simple boring bars perform multiple boring and chamfering.

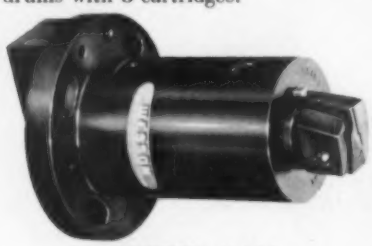


CLUTCH HOUSING

Bores and faces clutch housing of cast aluminum. Facing units have special cartridges.

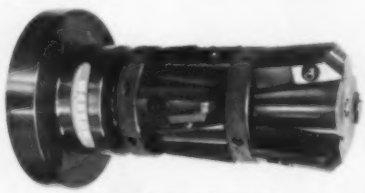
BRAKE DRUMS

This boring tool R & F bores brake drums with 8 cartridges.



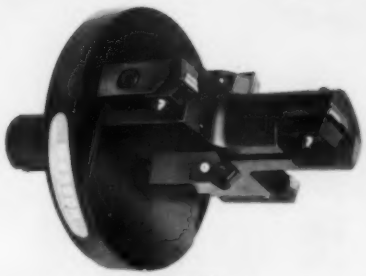
ALUMINUM SLABS

Milling cutter units to closely control face run-out in slab milling of aluminum ingots.



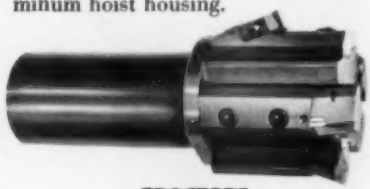
CONNECTING RODS

Rough and finish bores big ends of rods, Three cartridges per diameter simultaneously adjustable.



HOISTS

Semi-finish bores, chamfers end and faces flange in one operation on aluminum hoist housing.

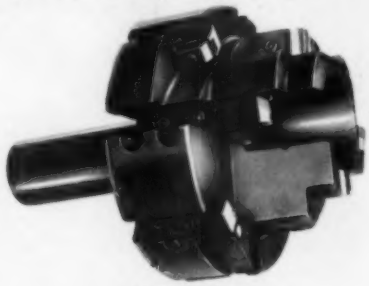


TRACTORS

Rough bores, grooves, chamfers both ends and finish bores collar coupling.

ROAD BUILDING EQUIPMENT

R & F connecting rods to a diameter tolerance of only ±0.0002 in.



CONVERTER

Bores, counterbores, turns ID of hub, triple-faces and double-chamfers converter housing.

tools Wesson carbide Wessonmetal

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1:00 pm to 10:00 pm
(closed Sunday)

NOTE: Opens one day later, closes one day earlier than the other shows

Domestic and foreign machine tools and equipment, located at a point midway between the Machine Tool Exposition and the Production Engineering Show. New products introduced at the show are described in this section. All will be on display, along with many others previously described in AM/MM.

HOW TO GET TO THE COLISEUM MACHINERY SHOW:

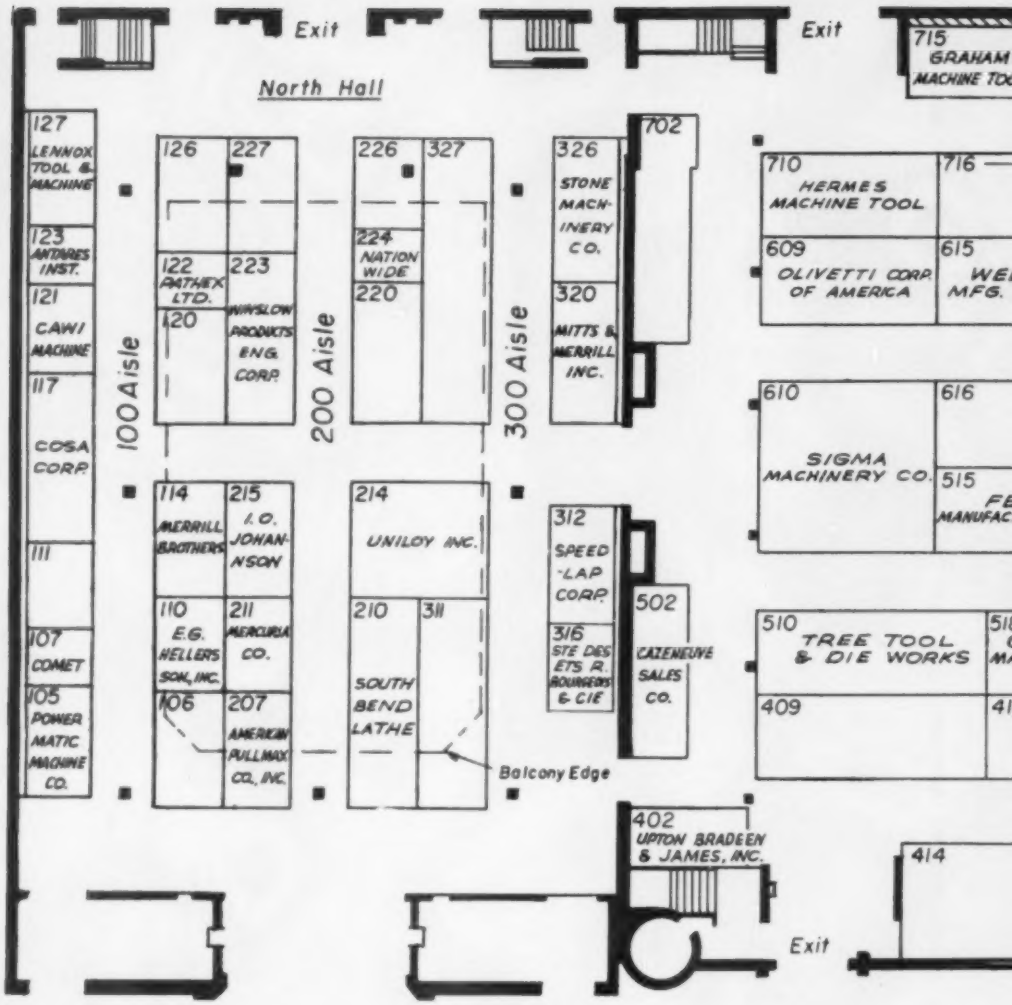
BUS: No. 4 traveling south on Wabash Ave from Randolph St.

PRIVATE CAR: Drive south on Michigan Ave to 14th St, turn right (west) on 14th (a one-way street) to Wabash, then left (south) to the Coliseum. Or drive directly down Wabash from the Loop. If you want to end up on the correct side of the street, drive south on Michigan Ave to 16th, west to Wabash, north to the Coliseum.

SUBWAY: Take State Street Subway trains south to 12th (Roosevelt Rd). Walk one block east to Wabash, south to the Coliseum.

American Machinist / *Metalworking Manufacturing*

PULL OUT FOR FLOOR PLAN AND LIST OF EXHIBITORS →



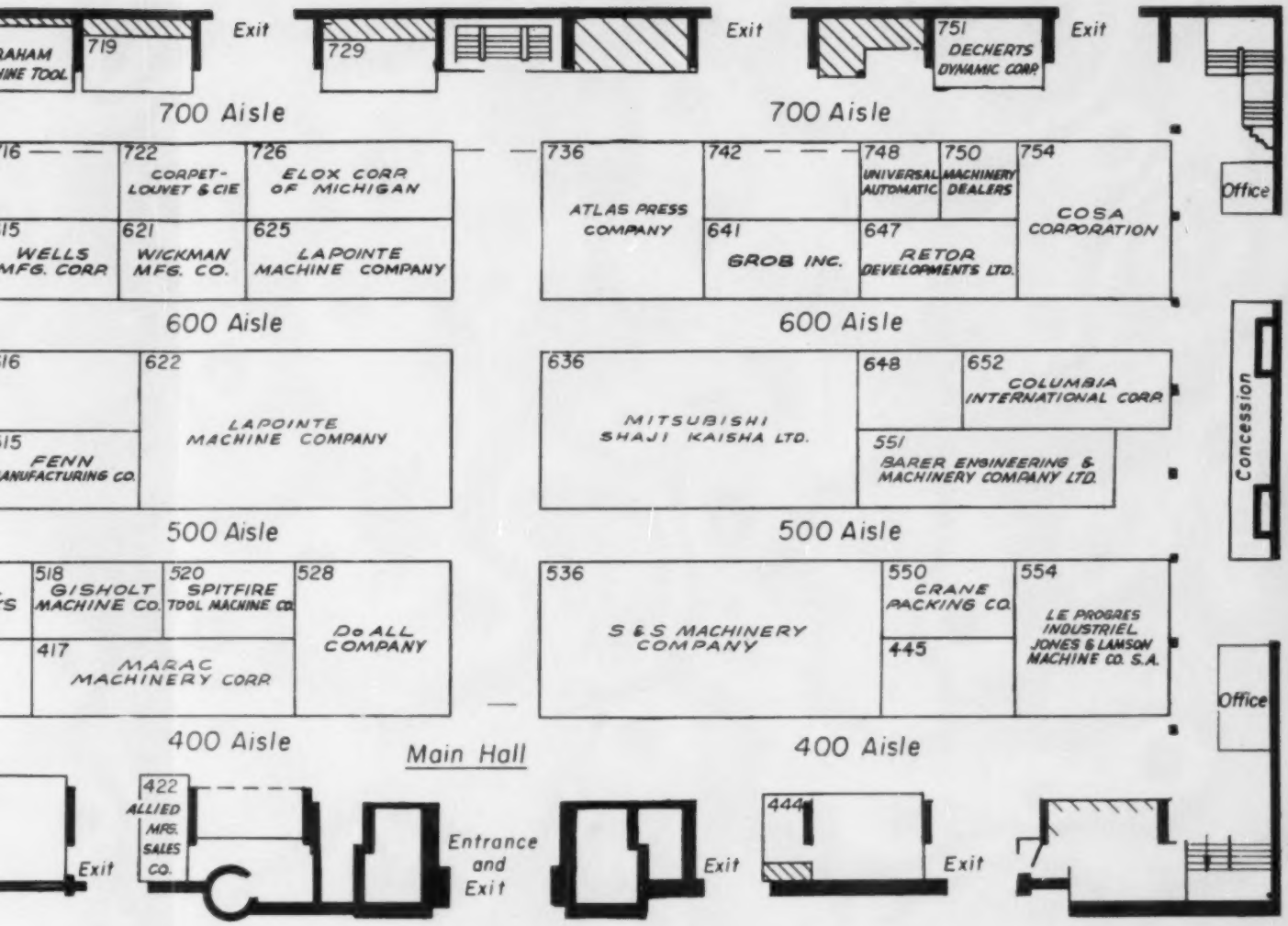
COLISEUM
MACHINERY SHOW
Chicago, Illinois
September 7 to 15, 1960

224 Nationwide Engineerin
Service
Culver City, Calif

609 Olivetti Corp of Americ
Long Island City 1, N Y

122 Pathex, Ltd
Buffalo 2, N Y

105 Powermatic Machine Co
McMinnville, Tenn



647 Retor Developments Limited
Gault, Ontario, Canada

433(½), 536, 544 S & S Machinery Co
Brooklyn 32, N Y

610 Sigma Machinery Co
New York 16, N Y

210 South Bend Lathe, Inc
South Bend 22, Ind

312 Speedlap Corp
Skokie, Ill

520 Spitfire Tool Machine Co
Chicago 41, Ill

326 Stone Machinery Co, Inc
Manlius, N Y

510 Tree Tool & Die Works
Racine, Wisc

214 Uniloy, Inc
Saline, Mich

748 Universal-Automatic Corp
Schiller Park, Ill

402 Upton Bradeen & James, Inc
Toronto 5, Ontario, Canada

615 Wells Manufacturing Corp
Three Rivers, Mich

621 Wickman Manufacturing Co
Oak Park 37, Mich

223 Winslow Product Engineering Corp
Arcadia, Calif

List of Exhibitors

422 Allied Manufacturing & Sales Co
Chicago 22, Ill

207 American Pullmax Company, Inc
Chicago 14, Ill

123 Antares Instruments, Inc
Woodside 77, N Y

736 Atlas Press Company
Kalamazoo, Mich

551 Barer Engineering & Machinery Co, Ltd
Montreal 3, Canada

312 R Beorgeois & Cie
Besancon, Doubs, France

121 Cawi Machine Co, Inc
Jersey City 2, N J

502 Cazeneuve Sales Company
San Francisco 7, Calif

652 Columbia International Corp
Long Island City, N Y

107 Comet Industries
Franklin Park, Ill

722 Corpet Louvet & Cie
Le Courneuve, Seine, France

117, 653, 754 Cosa Corp
New York 17, N Y

550 Crane Packing Co
Morton Grove, Ill

751 Decherts
Palmyra, Pa

222 Easco Products Inc
Ann Arbor, Mich

528 The DoALL Co
Des Plaines, Ill

726 Elox Corp of Mich
Royal Oak, Mich

515 The Fenn Manufacturing Co
Newington, Conn

518 Gisholt Machine Co
Madison 10, Wisc

715 Graham Machine Tool
New York 12, N Y

641 Grob, Inc
Grafton, Wisc

110 E G Hellers Son, Inc
Los Angeles 22, Calif

710 Hermes Machine Tool Co
Long Island City, N Y

215 I O Johansson Co
Skokie, Ill

521, 622, 625, 628 Lapointe Machine Co
Hudson, Mass

127 Lennox Tool & Machine Builders
Lima, Ohio

554 Le Progres Industriel
Jones & Lamson Machine Co S A
Lot, Belgium

750 Machinery Dealers National Assn
Washington 6, D C

417 Marac Machinery Corp
White Plains, N Y

111 Masters Precision Tools
Chicago 9, Ill

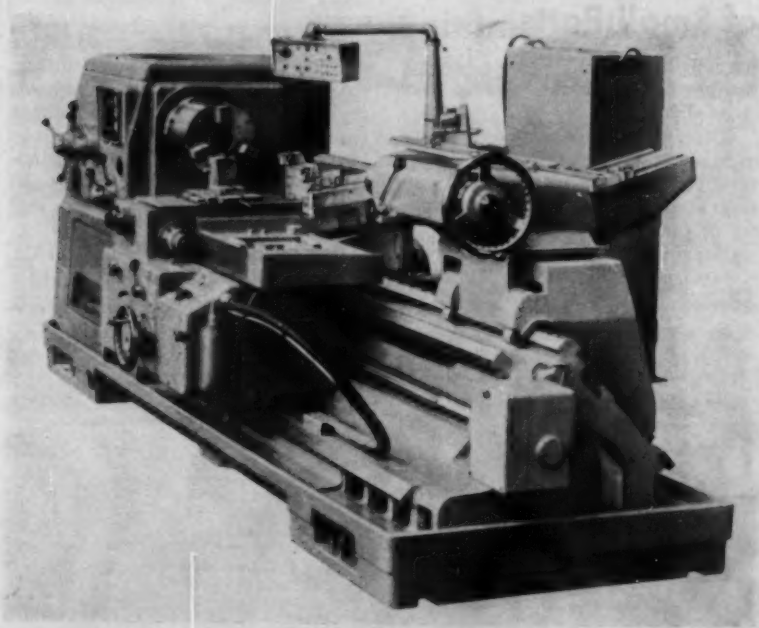
211 Mercuria Co
Clarendon Hills, Ill

114 Merrill Brothers
Maspeth 78, N Y

543, 636, 644(½) Mitsubishi International Corp
Los Angeles 14, Calif

320 Mitts & Merrill, Inc
Saginaw, Mich

Coliseum Machinery Show in Print



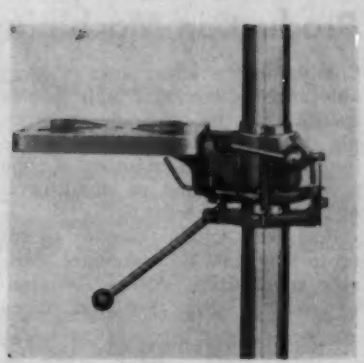
Gisholt-Cri-Dan Threading, Turning Lathe Adds Facing, Boring, Cutoff Operations

Cri-Dan FT 80 lathe is for single-point carbide work, but is fitted for all normal lathe operations as well as threading. Toolholder arrangement includes a slide, saddle, and carriage. Positive cam action moves the longitudinal slide and the cross-slide. The machine has tool relief and automatic return to start after the operation is completed.

Infeed and pass cycle can be preset and the machine stops after threading is finished. Turning is from a separate saddle with its own ways and self-contained drive. An independent templet-controlled tracing cross-slide is on the saddle.

Gisholt Machine Co, Madison 10, Wis—Booth 518

MORE DATA? Circle 491, inside back cover



Sectional Drillpress Tables Allow Multiple Setups

South Bend multiple table sections, ends, and legs allow table buildup to any size and shape to accommodate multiple head and column assemblies and work fixtures. Sections are easily assembled. Ends and inner legs have levelling features.

South Bend Lathe Wks, South Bend 22, Ind—Booth 210

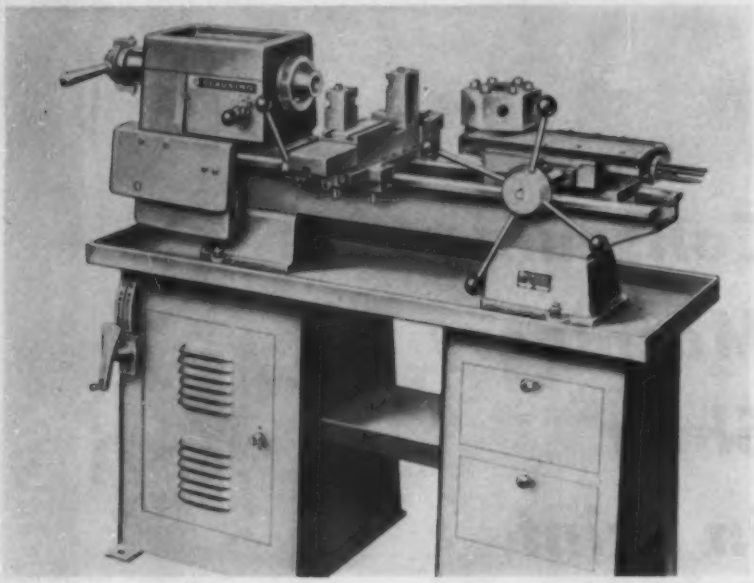
MORE DATA? Circle 492, inside back cover

South Bend Easy-Up Device Climbs Drillpress Column

Unique table elevation device without rack or screw is pumped to raise table. Action is entirely mechanical, and table load, angle, or position has no effect. It allows exact positioning.

South Bend Lathe Wks, South Bend 22, Ind—Booth 210

MORE DATA? Circle 493, inside back cover



Clausing High-Speed Turret Lathe Allows Production Machining of Small Parts

Combining the advantages of variable speed drives and high spindle speeds with the efficiency of multiple tool stations, this new lathe is an economical solution to the accurate machining of small parts on a production basis.

Features include: spindle speeds up to 3200 rpm, 2-speed motor, variable speed drive, ASA—L-00 spindle with 1⅜-in. thru-hole, flame hardened ways, Timken-bearing equipped bed turret, double tool cross slide.

Clausing will also show new Clausing-Colchester geared-head lathes equipped for high-speed thread cutting and a new 12¾-in. hydraulic tracer lathe.

Clausing Div, Atlas Press Co, Kalamazoo, Mich—Booth 736

MORE DATA? Circle 494, inside back cover

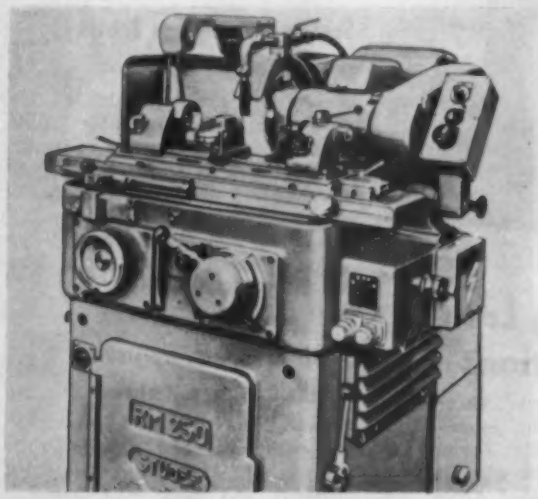
German Band Saw Features Infinitely Variable Speeds

Mossner Rekord Model SSF 500 vertical contour metal band saw and filing machine features infinitely variable cutting speeds from 50—3000 fpm. They are regulated by turning a handwheel, and read directly in fpm on a built-in speedometer.

With a direct high speed drive of 7700 fpm for friction cutting, the machine has aluminum wheels coated with vulcanized rubber hands. It is equipped with built-in butt-welder with shear and a grinding motor, chip blower, weight operated feed, 4-way tilt table, and 4 hp motor.

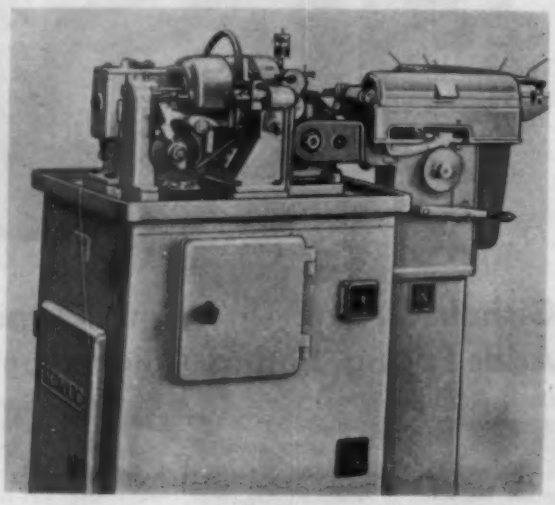
Dist by Hermes Machine Tool Co, Long Island City, N Y—Booth 710

MORE DATA? Circle 495, inside back cover



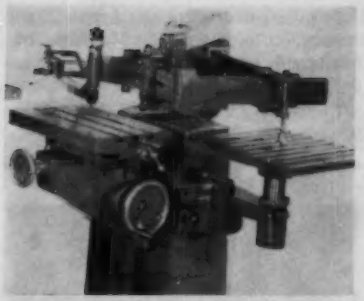
STUDER RM 250-L HIGH PRECISION external cylindrical grinder is being shown for the first time. It has a one-lever control, automatic cycling, table traverse—Cosa Corp, 405 Lexington Ave, New York 17, N Y—Booth 653

MORE DATA? Circle 496, inside back cover



ESCOMATIC D4 COIL-FED automatic form-turning machine does precision form turning and end operations on small parts. It has a 3-spindle turret—Cosa Corp, 405 Lexington Ave, New York 17, N Y—Booth 653

MORE DATA? Circle 497, inside back cover



Kuhlmann Panto-Millers Can Mill Directly from Drawings

This line of pantograph engravers (Model Gm IIa shown) is designed for heavy cutting and for a wide range of general engraving, die, mold, and profiling operations on flat work, or by use of a forming guide on curved uniform surfaces. The show model has an attachment for milling patterns direct from a drawing.

The Gm IIa has a 17 x 12 in. working area of the pantograph (Copy table is 16 x 16 in.) whose bars are so sturdy that no deviation will occur at any reduction ratio.

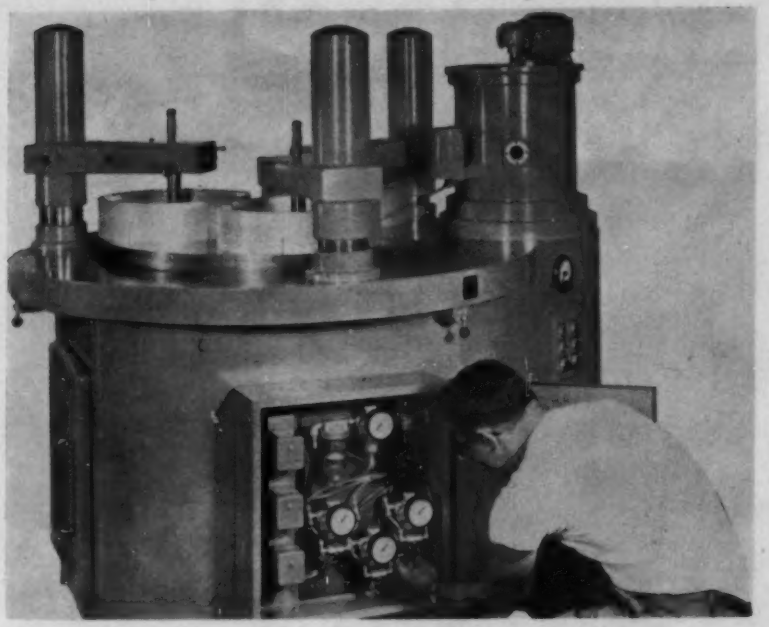
Work table has longitudinal, cross, and vertical feed by hand wheels fitted with calibrated drums for precision settings. Master copy table can be raised and lowered by hand to most convenient level for current job. It can also be set eccentrically for tracer to cover the full area possible at each of the reduction ratios from 1:1 to 1:10.

Antares Instruments Inc, 55-02 37th Ave, Woodside 77, N Y—Booth 123

MORE DATA? Circle 498, inside back cover

"G" CLAMP, with a drop forged universal joint, is designed for use where unusual side strains are brought to bear on shackles in rolling drums or tanks while welding. This heat treated clamp has a safety factor of 5 to 1 and is available in six standard sizes—*Merrill Brothers, Artic St, Maspeth, N Y*—Booth 114

MORE DATA? Circle 499, inside back cover



Spitfire Flat Lapping Machine Handles Larger Pieces, More Smaller Parts

Gyro-Matic 36-in. flat lapping machine is engineered to provide ultra-precise finishing for large parts as well as increased volume output of smaller parts per cycle. With the capacity to obtain optical flatness to 1 light hand (0.000,011,6 in.) the machine may be applied to parts directly from turning, milling, or sanding operations. Secondary steps are often unnecessary.

The 36-in. lapping plate is a special close-grained cast alloy—heat treated, radially grooved, and precision machined. Regardless of the type or size of abrasive used, a four-station metering disc assures desired abrasive flow without disc or plate removal. A simple one screw arrangement permits this operation which keeps grit suspension at the proper level.

With three 16½-in. rings, the 36-in. machine has a working area height of 37½ in. Abrasive tank capacity is 5 gal.

Spitfire Tool & Machine Co, 2931 N Pulaski Rd, Chicago 41, Ill—Booth 519

MORE DATA? Circle 500, inside back cover

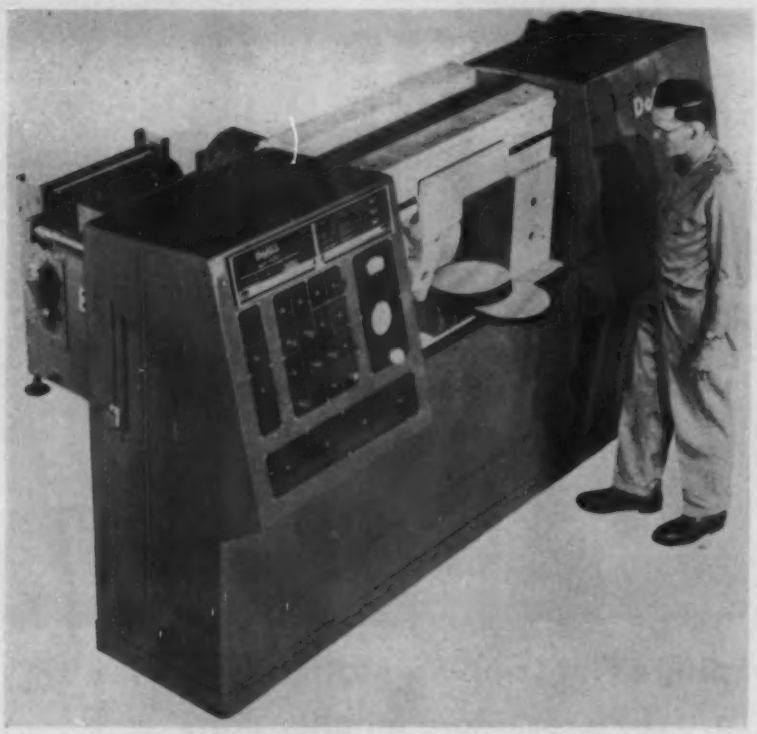
Metalmastr Cuts Hole in ¼-in. Steel with No Starting Hole

Model TE-250 shearing, forming, and piercing machine also features: simplified stroke adjustment with positive stroke scale and a streamlined design which has all controls on one side of machine. It will cut in the center of ¼-in. mild steel plate without a starting hole.

This new Metlmastr—largest of the line—has a maximum edge-cutting capacity of 1 ga in mild steel plate and 5 ga in stainless. Throat depth is 49¼ in., permitting circle cutting up to 48-in. dia inside the throat. The cutting speed of up to 36 fpm gives cuts of from 1750 to 3500 a min.

Lennox Tool and Machine Builders, Lima, Ohio—Booth 127

MORE DATA? Circle 501, inside back cover



DoAll Continental Power Cutoff Saw Indexes to 24 in, takes Work 16 x 20

Power saw for high-speed, continuous operation can be fitted with new DoAll 2-in. blades, carbide or HSS. The machine indexes automatically from 0 to 24 in. in thousandths, leaving a stub end of 2½ in. With manual indexing, stub will be 1 in.

Other equipment announced includes improved model C-70 cutoff saw. Cold-point drilling with coolant fed through the drill to the drill-point leading edges makes it possible to drill clean, accurate holes without burrs. This technique is effective on hard and exotic metals.

DoAll Co, Des Plaines, Ill—Booth 528

MORE DATA? Circle 502, inside back cover

Mimik Templator Copies Contour Shape from Drawing

Retor device cuts tracing templets directly from a drawing, without layout, sawing, filing, grinding, or polishing. The Templator makes templets in 0.003-in. shim stock, which are sandwiched between layers of stiffening plastic, but with k/32 in. of the templet projecting on all edges. Runs in hunderds of pieces have been made with under a thousandth wear of the templet.

The Templator attached to any quill-type vertical miller. Time to produce a templet is 15 to 45 min; cost of the attachment is $500.

Retor Developments, Inc, Argyll Rd, Galt, Ontario—Booth 647

MORE DATA? Circle 503, inside back cover

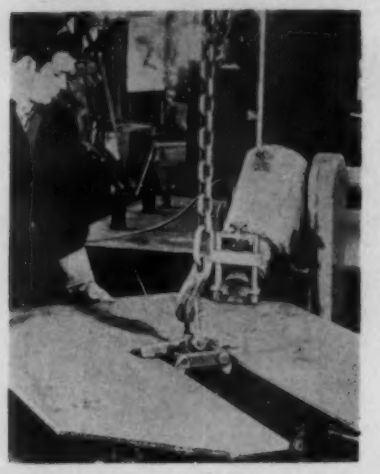
Speedlap Microsize Unit Sizes Wafers to 0.0001 in.

Microsize unit works with a standard 12-in. Speedlap machine to size germanium or silicon wafers (for semiconductor applications) to 0.005 in. thickness ±0.0001 in. at 300-400/hr.

Speedlap machine provides grinding productivity with lapping accuracy, it is claimed. Machine has hardened lap plates, water cooling, and flatness control.

Speedlap Corp, 8022 N Monticello, Skokie, Ill—Booth 821

MORE DATA? Circle 504, inside back cover



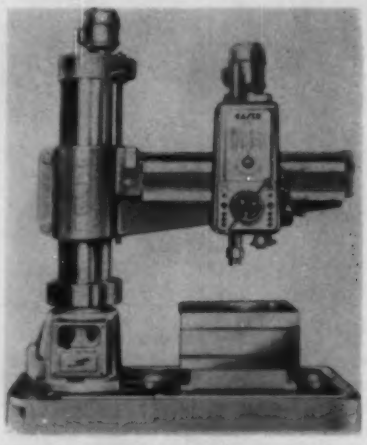
Serrated Cutter Bevels Plate Before Fillet Weld is Made

Pullmax X-8 beveler cuts bevels at 30°, 37½°, or 45° on plate stock with a serrated cutting wheel. This prepares the metal for fillet welding, without slow grinding or torch cutting.

The company claims this method is ten times as fast as older methods, and requires little skill from the operator.

American Pullmax Co, 2455 N Sheffield Ave, Chicago 14—Booth 207

MORE DATA? Circle 505, inside back cover



Italian Radial Drill Has Full Preselection of Speeds, Feeds

Caesar radical drill Model F50/5, with a 16-in. column and 5-ft arm,

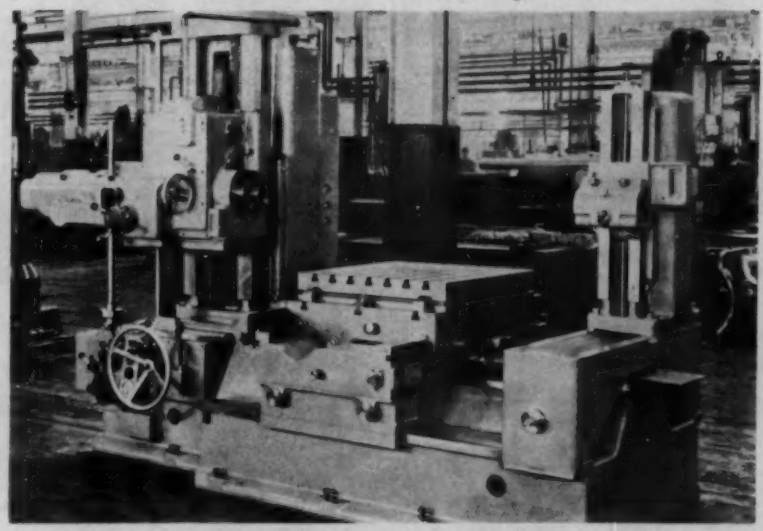
has full preselection of the 16 available speeds and 9 feeds, single pushbutton hydraulic clamping of column and head. The pushbutton elevation of the arm is combined with automatic locking or unlocking of arm on the column.

With one clutch lever for start, stop, and reverse of spindle and for engagement of preselected speeds and feeds, the machine is equipped with a safety overload clutch which automatically disengages the feed in case of breakage or excessive wear of the elevation nut. Drilling head has automatic forced lubrication.

Also on display will be the Model F25/3, which has an 8-in. column and a 3-ft arm.

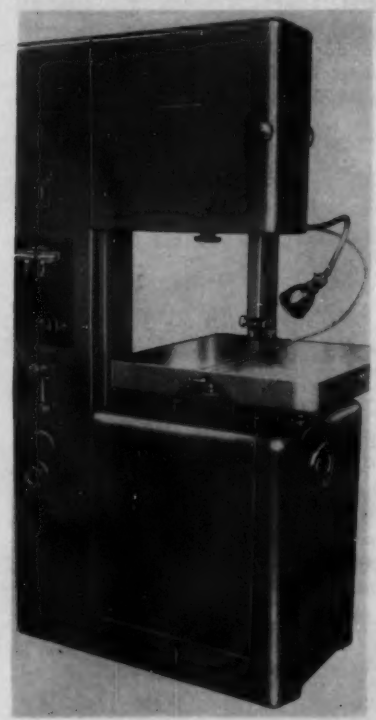
Dist by Hermes Machine Tool Co, Long Island City, N Y—Booth 710

MORE DATA? Circle 506, inside back cover



LAPOINTE-CHURCHILL AUTOMATIC INTERNAL GRINDER, model HBM, is a British machine sold fully tooled by Lapointe in the US. Other machines from England are a Lapointe-Hayes copying die-sinking machine and a Lapointe-Kearns horizontal toolroom boring machine. *Lapointe Machine Co, Hudson, Mass*—Booth 521, 622, 628, 625

MORE DATA? Circle 508, inside back cover



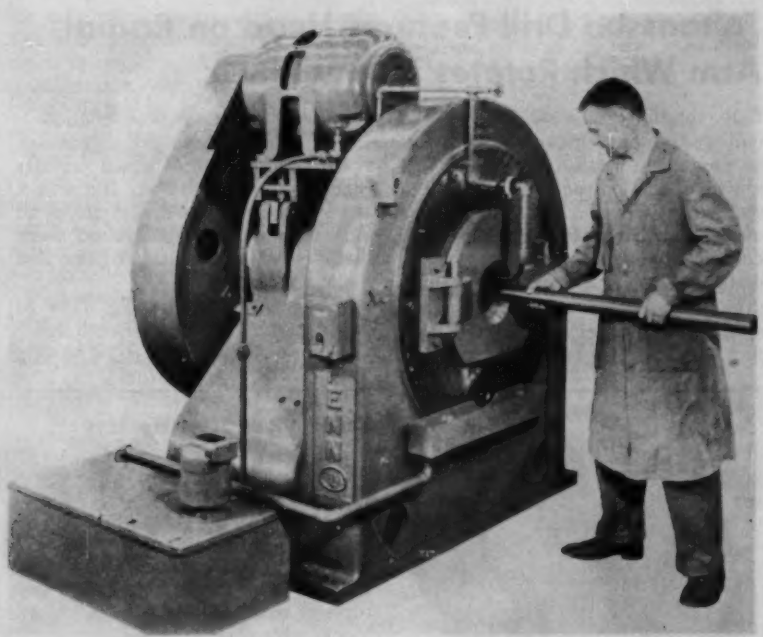
Powermatic Metal-Cutting Saw Has Instant Speed Selection

Speed control without parts change or belt shifting is instantly available on bandsaw equipped with vari-drive and two-speed transmission. Speed shift can be made with saw in motion.

The bandsaw, Model 87-20 in., has accessories, including contour cutting device, circle cutter, and file-band attachment.

Powermatic Machine Co—Booth 105

MORE DATA? Circle 507, inside back cover



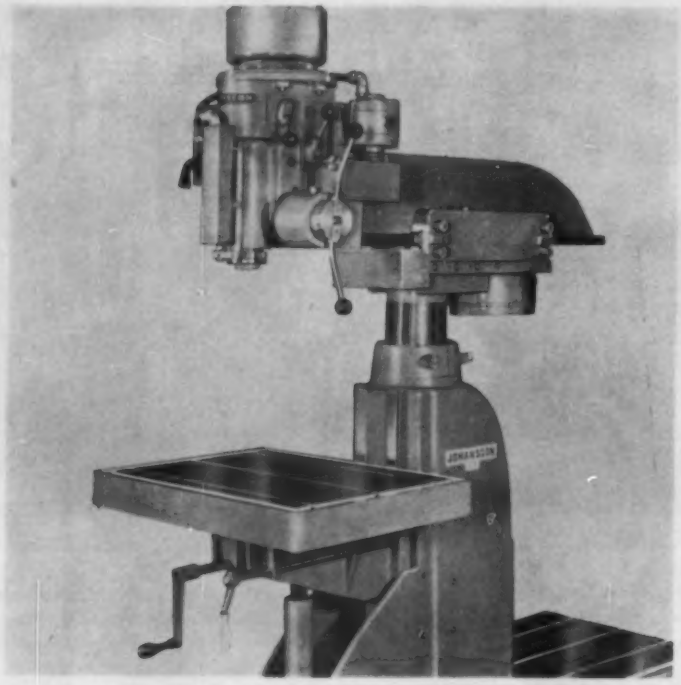
Fenn Tube-Point Swaging Machine Works 5½-in. Tube, 2¾-in. Bar

Fenn swaging machines include model 7F for tube pointing, a number of two-die and four-die standard swaging machines, a Hydroformer with hydraulically operated wedges for wide die opening and internal and central reductions, and No. 25-H hydraulic feed for operation with automatic loading and unloading accessories.

The feed unit is mounted on a welded-steel bed with pump, motor, valve panel, and tank.

Fenn Mfg Co, Newington, Conn—Booth 515

MORE DATA? Circle 509, inside back cover



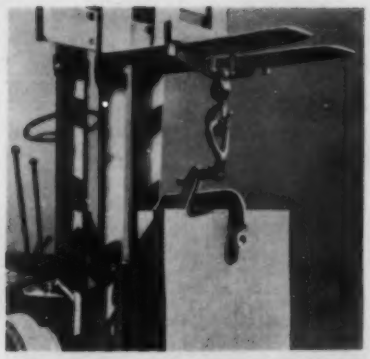
Johansson Drill Features Head on Radial Arm Which Rotates Through 360°

Full rotation of a sliding three-foot radial arm makes it possible to move the head of this drill to any hole location required in a workpiece up to six feet in diameter and over four feet high. The ram and column of this precision radial drilling machine are accurately ground and the radial arm slides on precision roller bearings to permit sensitive and fast adjustment of drill head over each hole location.

Two work stations are accessible: a 20 x 40-in. table which adjusts vertically through 16 in., and a 22 x 24-in. rear work platform. Both of these have accurately ground work surfaces with finished T-slots and coolant trough.

The I O Johansson Co, 7248 St Louis Ave, Skokie, Ill—Booth 215

MORE DATA? Circle 510, inside back cover

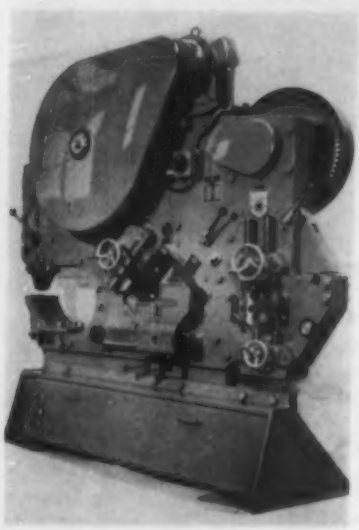


AUTOMATIC SAFETY LOCK fork lift attachment simplifies transporting of heavy loads such as dies or motors. It is made entirely of forgings, including a safety swivel hook. When slipped onto forks, two knife-edgd levers grip forks tightly as load is applied, but can be easily slipped off when load is released—*Merrill Brothers, Artic St, Maspeth, N Y*—Booth 114

MORE DATA? Circle 512, inside back cover

2-TON STRUCTURAL CLAMP has a "short leg" feature to provide a secure bite on even small junior size beams. Completely drop forged, these clamps have a grip range of 0-1 in., are 100% proof tested at 6 tons, and have a safety factor of 5 to 1—*Merrill Brothers, Artic St, Maspeth, N Y*—Booth 114

MORE DATA? Circle 513, inside back cover



Peddinghaus Steel Workers Available in Five Sizes

Popular with structural steel and ornamental iron shops, these universal steel workers can handle steel plate, angles, tees, squares, and rounds. One of the outstanding features of this line is the universal die block which eliminates the changing of die blocks still necessary in other machines of this type.

The shear end has a newly designed two-spindle hold down which permits rapid adjusting for various thickness of plate—a great improvement over the common mushroom type.

Dist by Upton Bradeen & James Inc, 18067 Wyoming Ave, Detroit 21, Mich—Booth 402

MORE DATA? Circle 511, inside back cover

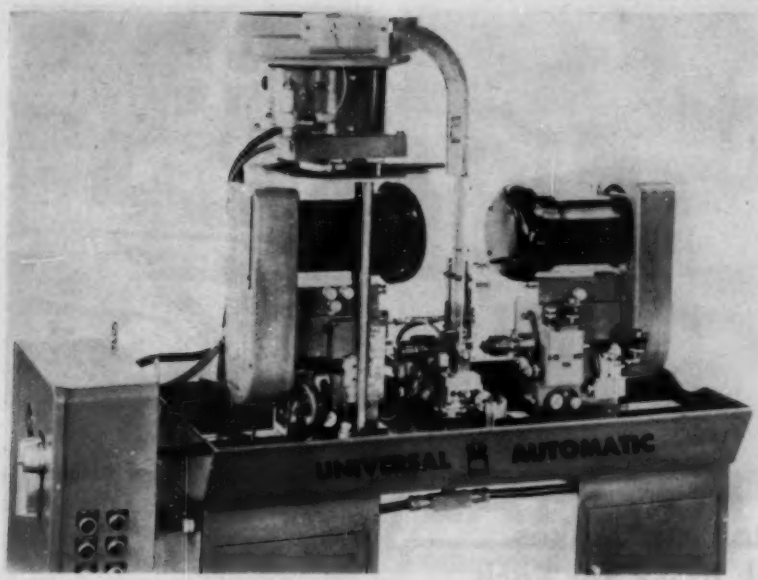
Sparcard Will Demonstrate Carbide Deposition for Tools

The Sparcard being featured at the Show will demonstrate carbide deposition, which is fast becoming an accepted means of increasing tool life 50—400%. The Sparcard bonds carbides to the tool surface by electrical discharge, providing hardness and wear resistance to high speed tools.

Sparcarding of punches and dies increases life, eliminates galling, and prevents them from chipping or flaking.

Easco Products, Inc, P O Box 587, Ypsilanti, Mich—Booth 222

MORE DATA? Circle 514, inside back cover



Universal-Automatic Machines Will Do Secondary Operations in Shop Conditions

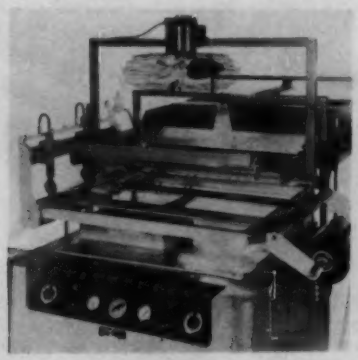
A new line of high speed, fully automatic machines and systems for secondary operations are especially useful to speed up drilling, tapping, reaming, nut tapping, cross-drilling, hollow-milling, counter sinking operations.

The machines and systems consist of one or more units. These units may be mounted at any angle or in any desired position. Each unit has an individual spindle drive motor with speeds ranging from 500—10,000 rpm; therefore, each spindle can run at the proper speed for the operation being performed. The self-contained unit has a maximum spindle stroke of 2½ in. and is adjustable down to ⅛ in. Capacity of 0.020—⅝ in. drilling and/or up to ⅜ in. tapping in mild steel.

Machines being demonstrated are a two-spindle horizontal machine with automatic hopper feed (shown), a single spindle horizontal machine with automatic hopper feed, and a two spindle horizontal machine.

Universal-Automatic Corp, Schiller Park, Ill—Booth 748

MORE DATA? Circle 515, inside back cover



Comet Vacuum-Forming Machine Has Automatic Feed Attachment

Greatly increased production capacity is attained by Comet vacuum-forming machines with the addition of an automatic stock feed attachment. The unit loads and unloads the clamp frame, feeds the plastic stock, and slits the web into strips to separate blisters or skin packages after they are formed.

The attachment can be added to existing machines in four standard sizes, or ordered on new machines.

Comet Industries, Franklin Park, Ill—Booth 107

MORE DATA? Circle 516, inside back cover

Grob Machine Demonstrates Rolling of Gear Bars

A No. 10 Grob roll, which has a 6—12-in. capacity with an 8-ft bed, will be cold rolling 6/7 pitch 20 degree P/A gear bars at the Show. The machine has twin rotors which are driven by universal joints and synchronized by timing gears with the work spindle located on the carriage. A 3 ton solid stress-relieved C-frame supports two 10-in. columns each having a 3-in. adjustment to 0.0001 in.

Grob Inc, Grafton, Wisc—Booth 641

MORE DATA? Circle 517, inside back cover

KOEPFER GEAR HOBBER 170 is a fully automatic production machine with magazine feeding, which limits necessary labor to loading the magazine and checking finished workpieces. It performs equally well in conventional or climb-hobbing. The 170 is equipped with production program control—*Cosa Corp, 405 Lexington Ave, New York 17, N Y*—Booth 653

MORE DATA? Circle 518, inside back cover

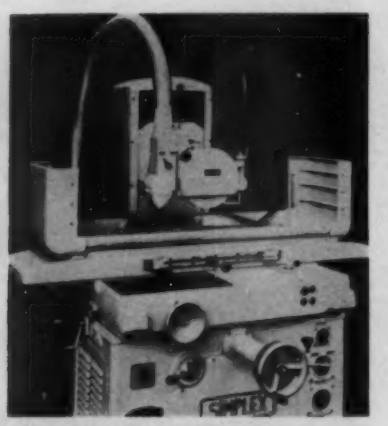
Single Spindle Bar Automatic Makes Components from Stock at 0.8 Sec Each

The high production rate of this machine (down to 0.8 sec per piece-part from bar stock) is possible because of a maximum spindle speed of 7500 rpm, quick acting side tools which operate simultaneously grouped around the spindle, and threading on the overtaking principle. This results in the overlapping of operations. Capacity of the automatic is ⅛ in. in steel and, with spindle adaptors, up to ⅝ in. in non-ferrous materials. Auxiliary attachments—which provide for drilling and turning, high speed drilling, longitudinal turning, slotting or combined slotting and cross drilling, rear drilling with two spindles, and nut tapping—increase its versatility and economy.

It can also be equipped with an opposed sychronized pick-up spindle for burrless cutting-off operations. This feature is important for short cycle time jobs where hundreds of scrap parts may be machined in a short time because a threading attachment automatically disengages the cam-shaft in case of any disorder in tapping or threading operation.

Wickman Products Corp, 10325 Capital Ave, Oak Park 37, Mich—Booth 621

MORE DATA? Circle 519, inside back cover



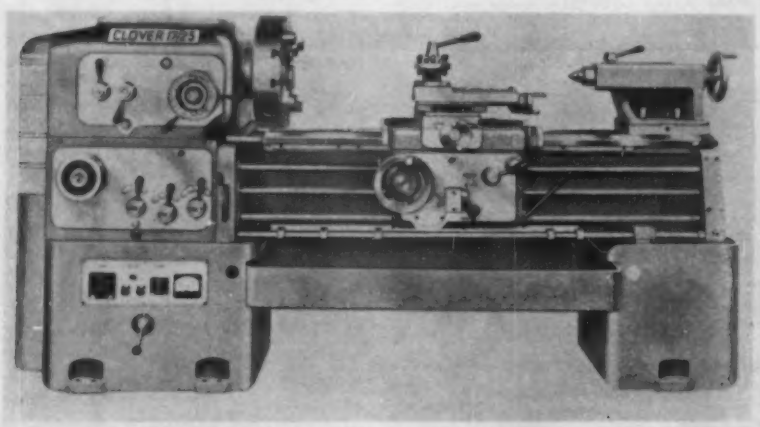
Blohm Surface Grinder, Model Simplex 7, Has Higher Column

A new edition to the HFS surface built by Blohm in West Germany, the Simplex 7 has a capacity of 12 x 28 in. and a higher column to allow greater work height. It is powered by a two-speed 5½-hp motor which is built as a single unit with the spindle.

Other features include: table and cross slide run on ball bearings; rapid traverse for cross slide; power elevation to spindle. It is also available in a 12 x 20 in. size.

Dist by Hermes Machine Tool Co, 48-15 Northern Blvd, Long Island City, N Y—Booth 710

MORE DATA? Circle 521, inside back cover



CLOVER LATHE (ITALIAN) MODEL 17/25, with 60-in. distance between centers, has 24 spindle speeds from 40—2450 rpm. Other features are an all-geared headstock, 3-bearing spindle, 7 hp motor. Spindle control is by double multidisc clutch combined with an electromagnetic brake—*Dist by Hermes Machine Tool Co, Long Island City, N Y*—Booth 710

MORE DATA? Circle 520, inside back cover

REDESIGNED PRODUCTION lapping machine, Lapmaster 24, is equipped with three retainers and hydraulic holddowns—*Crane Packing Co, Morton Grove, Ill*—Booth 550

MORE DATA? Circle 522, inside back cover

16 exceptional quality British-made PRECISION MACHINE TOOLS

presented by LAPOINTE at the

2nd COLISEUM Machinery SHOW

Chicago Coliseum, Sept. 7-15, 1960
(near the Loop)

A working exhibit...
every machine under power!

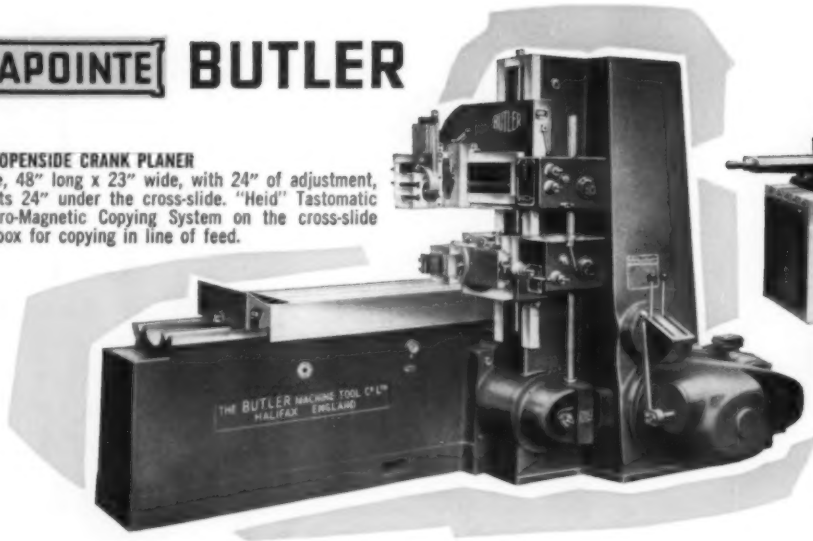
INDEX

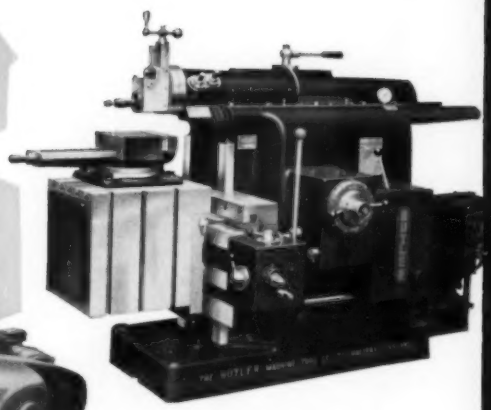
Super Shaper
Openside Crank Planer
Chucking Lathe
Engine Lathe
Ram Type Turret Lathe
Saddle Type Turret Lathe
Cylindrical Grinder
Automatic Internal Grinder
Surface Grinder
Gearbur Machine
Gear Planer
Universal Milling Machine
Automatic Copy Die Sinking Machine
Radial Drill
Horizontal Boring Machine
Rotary Positioner with Numerical Control

pictures inside ➡

LAPOINTE BUTLER

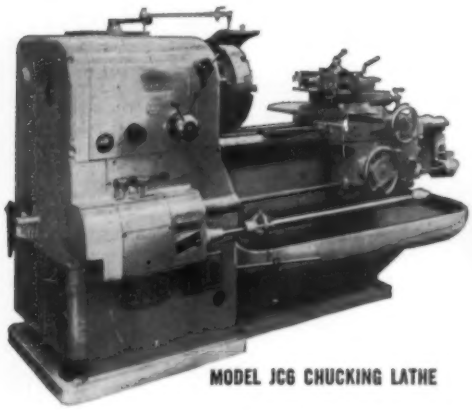
36" OPENSIDE CRANK PLANER
Table, 48" long x 23" wide, with 24" of adjustment, admits 24" under the cross-slide. "Heid" Tastomatic Electro-Magnetic Copying System on the cross-slide tool-box for copying in line of feed.





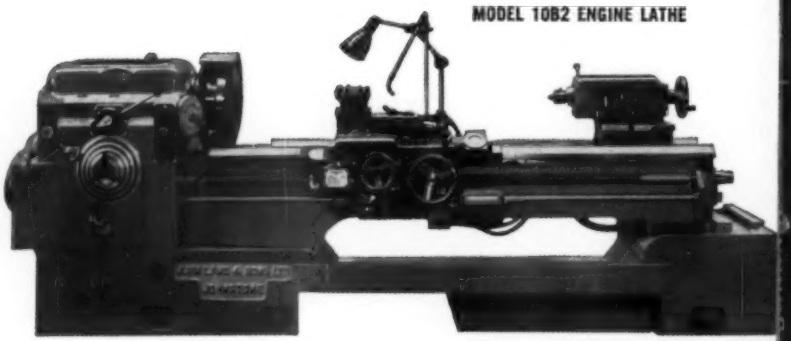
18" SUPER SHAPER

LAPOINTE LANG

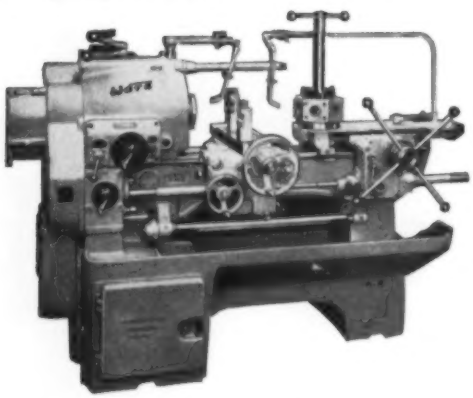


MODEL JC6 CHUCKING LATHE

MODEL 10B2 ENGINE LATHE

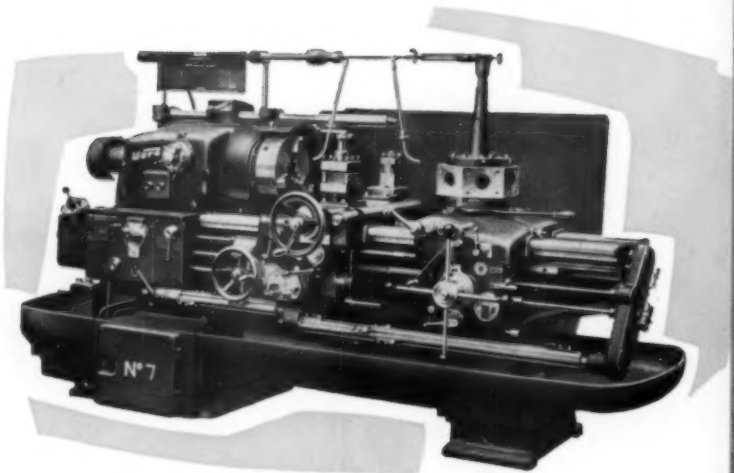


LAPOINTE WARD



MODEL 3DS RAM TYPE TURRET LATHE

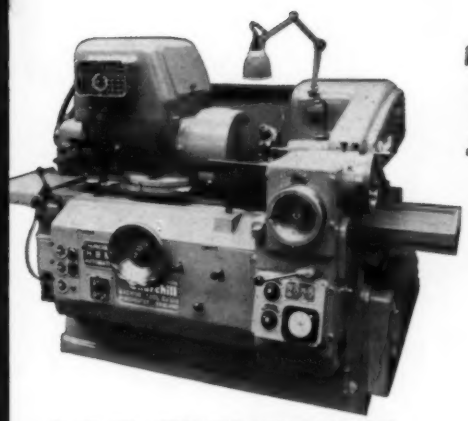
Height of center	7½"
Diameter of hole through spindle	1¾"
Diameter of bar that automatic chuck will take	1½"
Max. diameter that will swing over bed covers	14½"
Number of spindle speeds in each direction	12



MODEL #7 PRELECTOR-SADDLE TYPE TURRET LATHE

Height of center	8¾"
Swing over stainless steel covers	16"
Diameter of chuck which will swing over cross-slide	9"
Diameter of chuck which will swing up to edge of cross-slide	12"
Diameter of hole through spindle	2⅜"
Number of spindle speeds in each direction	12

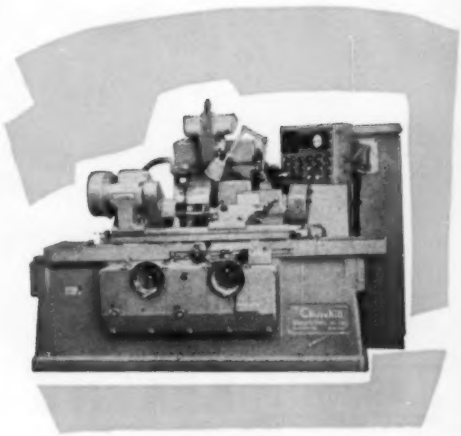
LAPOINTE CHURCHILL



MODEL HBM AUTOMATIC INTERNAL GRINDER

Max. swing inside the guard	12"
Max. swing over table	19"
Max. traverse of work table	18"
Max. bore diameter ground	9½"

MODEL NB 6 x 18 SURFACE GRINDER
Demonstrating the "Rotaform"



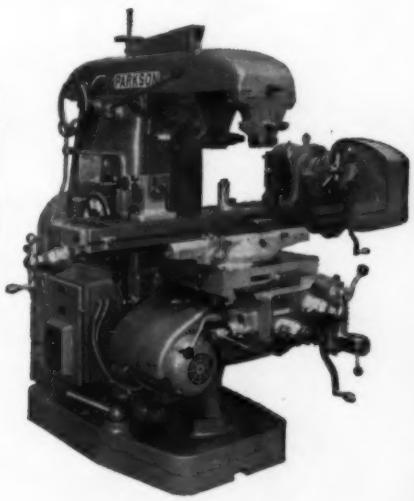
MODEL BW 10 x 36 CYLINDRICAL GRINDER
This machine is shown with diminishing feed mechanism, incorporating automatic wheel truing and compensation, together with automatic control of the machine cycle by electric sizing gage for plunge grinding work.

LAPOINTE PARKINSON

GEARBUR MACHINE

MODEL 5B SUNDERLAND GEAR PLANER
for Spur and Spiral Gears

Will cut spur gears up to ...	24" dia. 4" face 5 D.P. — ⅜" C.P.
Will cut spiral gears up to a combination of 60°, ⅝" normal pitch, 2¾" face	
Greatest distance, end of spindle to outer support	16½"
Hole through spindle	1½"
Taper hole in spindle	No. 12B. & S.
Diameter of arbor	1¼"

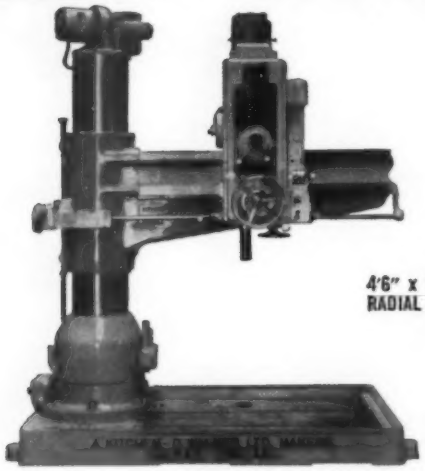


MODEL 2 NU UNIVERSAL MILLING MACHINE

LAPOINTE HAYES

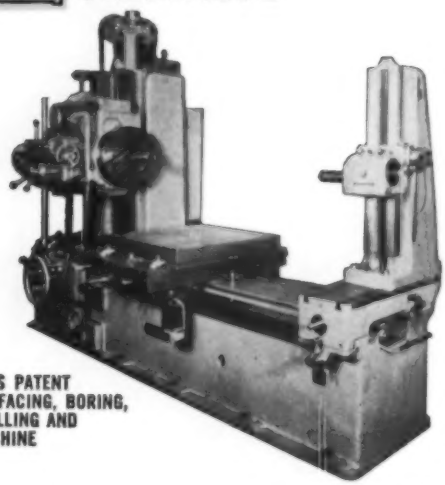
MODEL TM 43A AUTOMATIC
COPY DIE SINKING MACHINE

LAPOINTE KITCHEN-WALKER



4'6" x 14" COLUMN
RADIAL DRILL

LAPOINTE KEARNS



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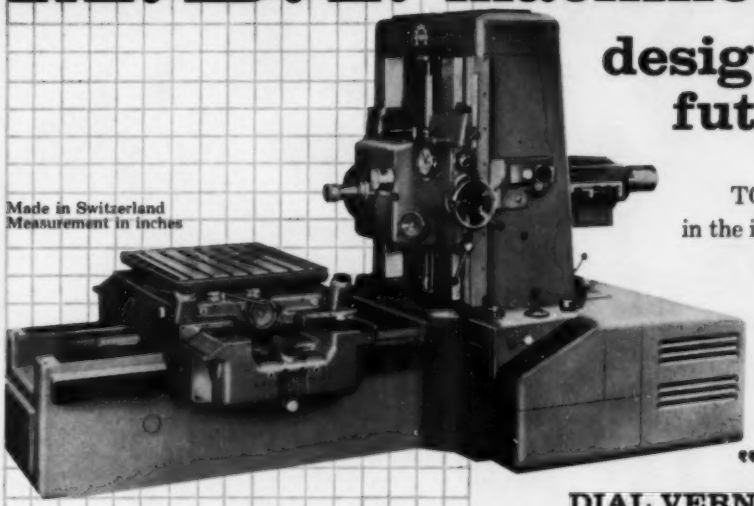

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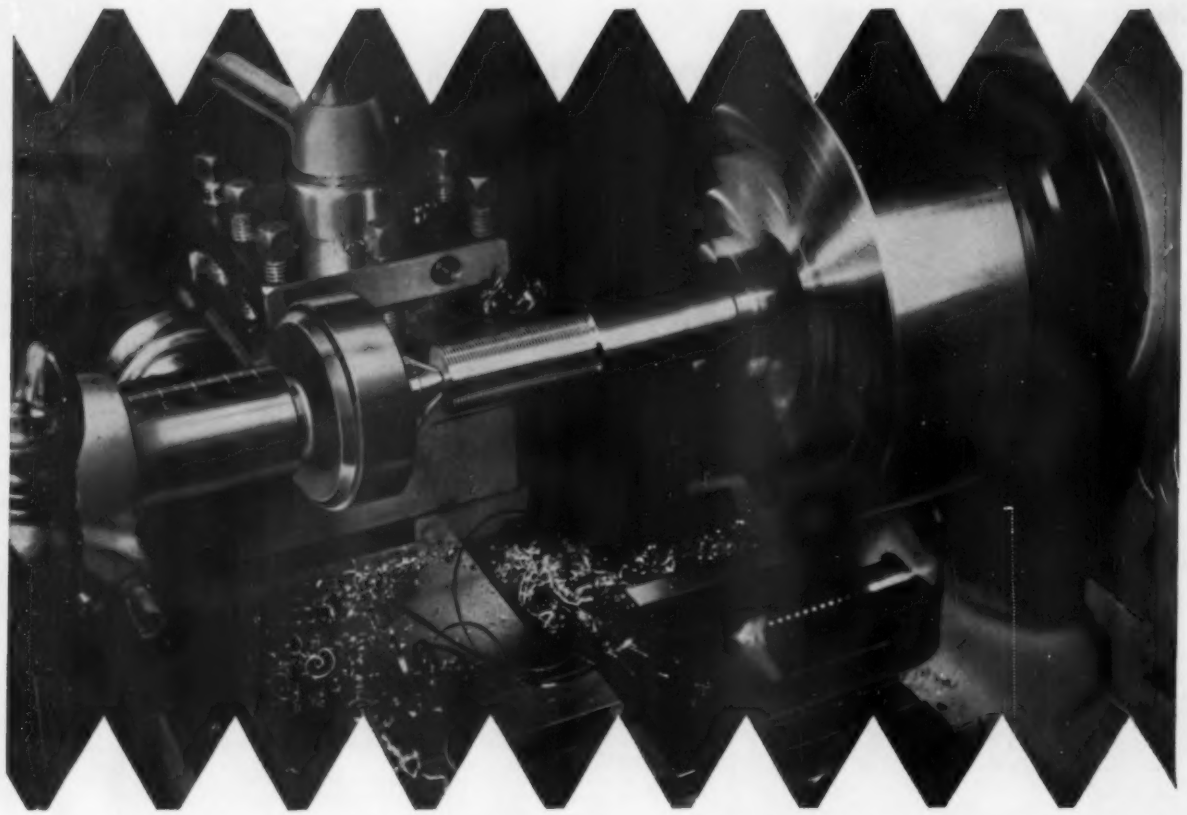

Now . . . cut threads 5 times faster with Clausing geared-head lathes

The Clausing-Colchester 13", 15", 17" geared-head lathes equipped with new high speed thread cutting unit—

(1) Cut threads five times faster than by normal methods

(2) Thread tight to a shoulder at maximum speed

(3) Cut internal threads without undercutting

(4) Take full advantage of carbide tools

(5) Minimize rejects

(6) Unit does not restrict normal use of the machine

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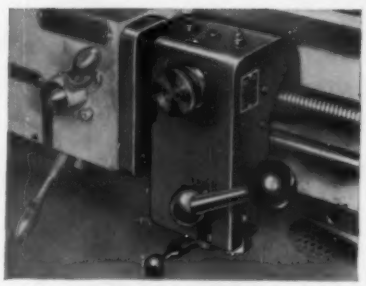
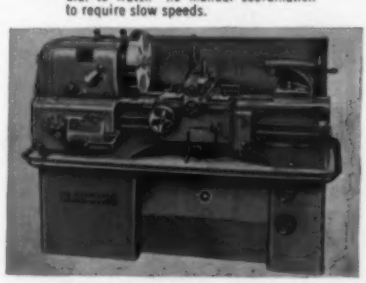
See This and Other Clausing Machine Tool Advancements at the COLISEUM MACHINERY SHOW in Chicago



Operation of the thread cutting unit is simple and fool proof. There's no revolving dial to watch—no manual coordination to require slow speeds.



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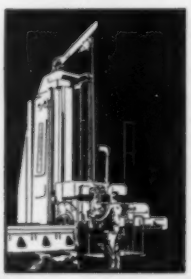

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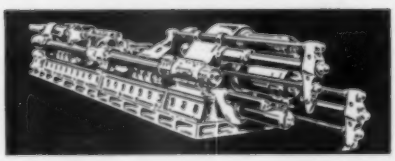
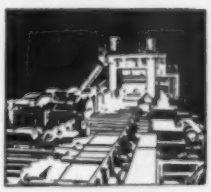
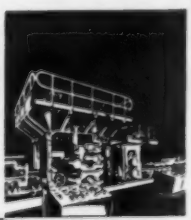
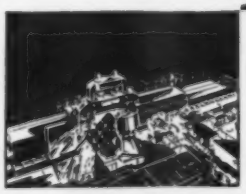
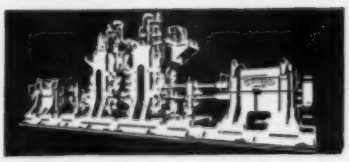
Pickling and shearing lines
Rolling mills for seamless steel tubes
Plants for production of large diameter butt welded tubes
Auxiliary equipments for tube plants
Complete steel works











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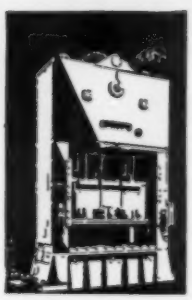

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NEW BOOKS...

MACHINE TOOL OPERATION—PART 2 (4TH EDITION). *By Henry D Burghardt, Aaron Axelrod, and James Anderson. Published by McGraw-Hill Book Co, 330 W 42 St, New York 36, NY. 681 pages, 5¼ x 8. Price $6.60.*

So thoroughly established in its field that it needs no detailed review, this new edition has been carefully revised, and new material added. The chapter on metallurgy has been expanded, and that on hydraulics now includes valuable information on the latest hydraulically operated machine tools. A whole new chapter has been added to cover metal-cutting bandsaws, and another on cutting fluids, while considerable new material has been added on the subject of cam milling.

Part 1 of this book was reviewed in an earlier issue (*AM*—July 13 '59 p216). Part 2 covers the shaper, planer, milling machine, grinding machine, hydraulics, bandsaws, metallurgy and cutting fluids—*HEL.*

•

DIE ZERSPANUNG DER EISENWERKSTOFFE (MACHINING OF FERROUS METALS). *By G Vieregge. Published by Verlag Stahleisen, Dusseldorf, Germany. 346 pages, 6x9. Price DM 40 ($10.00)*

This really complete work deals with the science of machining ferrous metals, including tool angles, speeds and feeds, chip formation, tool temperature, forces acting on tools, tool

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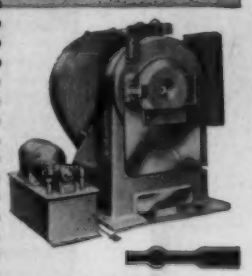

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NEW BOOKS . . .

wear, and the interrelation of these factors in the best combinations. It also gives data on the various tool materials available. The book is based, not only on the author's personal experience, but also on 160 references to prior art and science.

This reviewer has not run across any book in the English language that treats the subject as exhaustively as does Vieregge. It requires some 30 hours for even a cursory reading —several weeks for a detailed study —but is an excellent reference work for tool engineers and industrial engineers, provided they are familiar with the German language and the metric system. W TRINKS.

•

OIL HYDRAULIC POWER AND ITS INDUSTRIAL APPLICATION. *By Walter Ernst, vice president and director of engineering, Commonwealth Engineering Co of Ohio. Second Edition. Published by McGraw-Hill Book Co, 330 W 42 St, New York 36, NY. 466 pages, 6x9, $12.50*

Intended to give designers and engineers a well-rounded understanding of oil hydraulics, this book covers the field from the basics of fluid mechanics, through component and circuit design, to the latest information on commercial equipment and hints for operation and maintenance.

Industrial applications are given particular attention and a number of hydraulically actuated machines—machine tools, tracer-controlled machines, transfer machines, and others —are discussed in detail. This second edition includes new material on such

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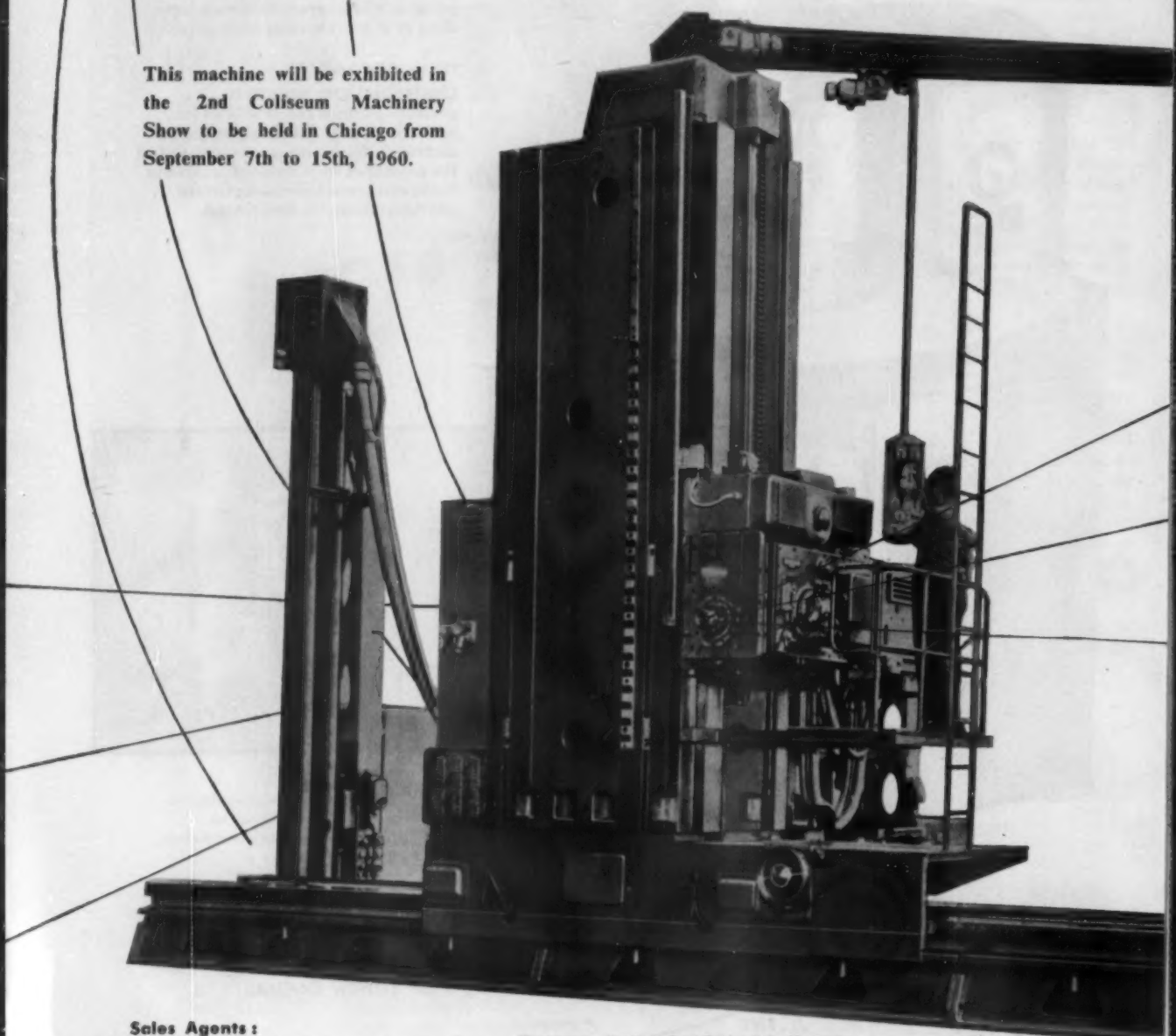
This machine will be exhibited in the 2nd Coliseum Machinery Show to be held in Chicago from September 7th to 15th, 1960.



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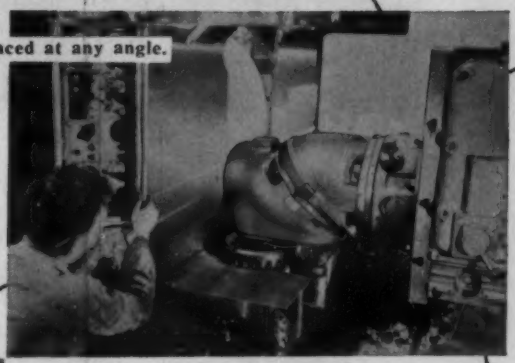
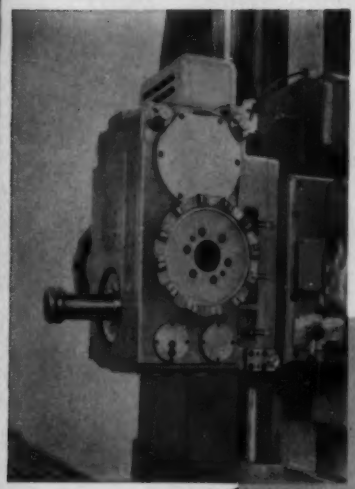
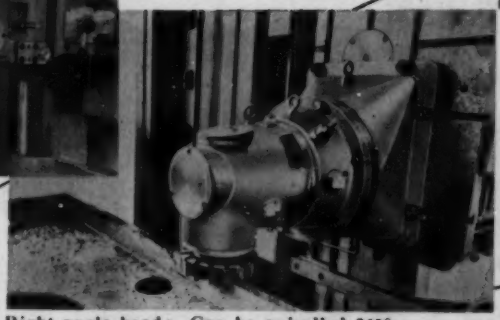
and combined machines

Universal head: Can be placed at any angle.



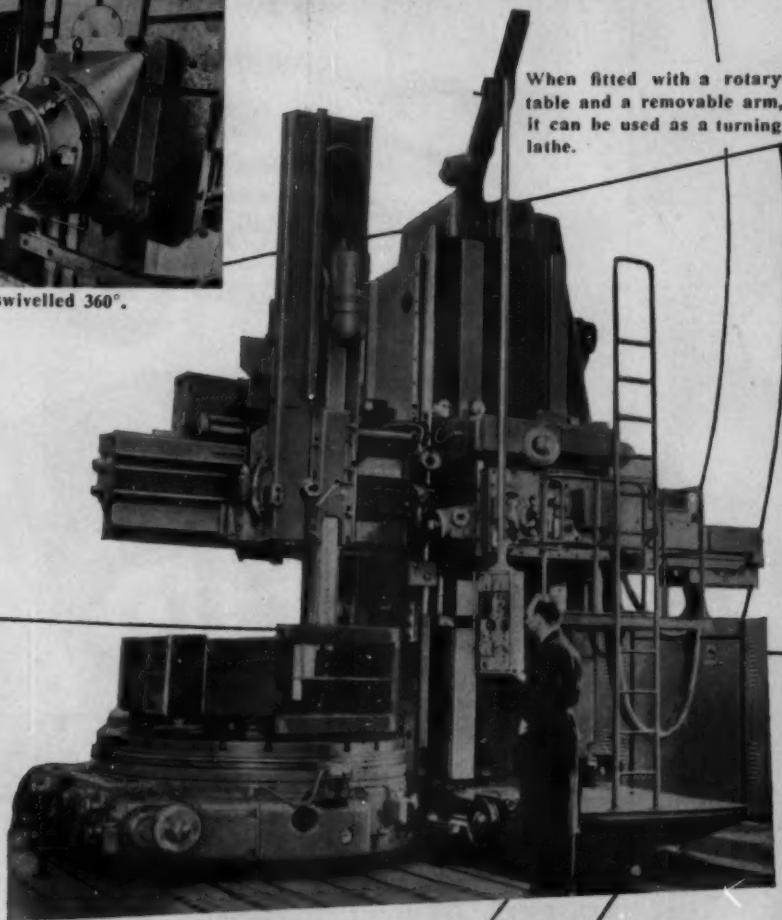


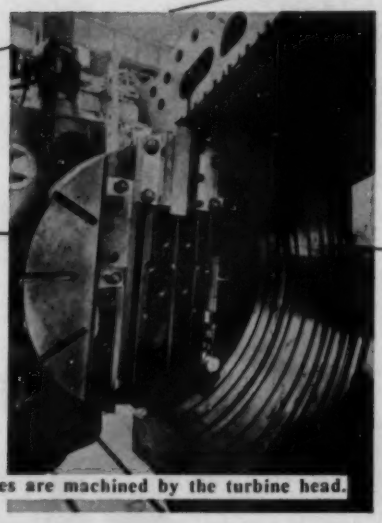
Milling can be done on three faces by the three way head.



Right-angle head: Can be swivelled 360°.

When fitted with a rotary table and a removable arm, it can be used as a turning lathe.





Grooves are machined by the turbine head.

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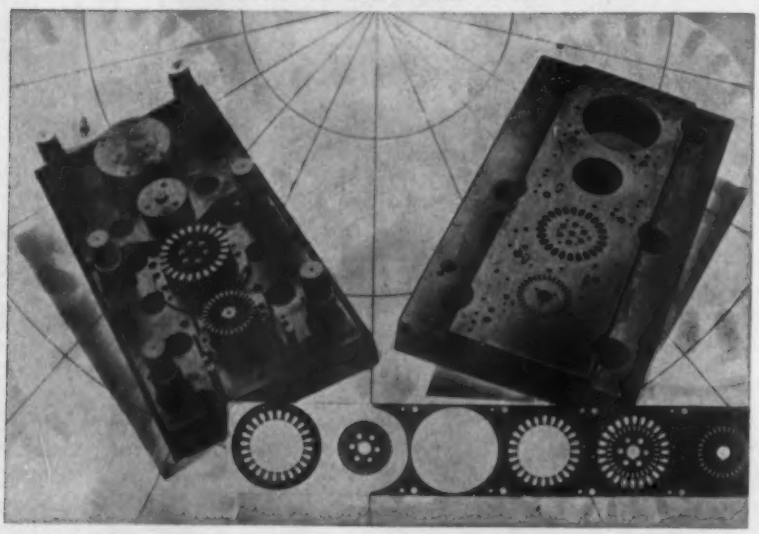

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subjects as remote and closed-loop pump control; transmission of hydraulic power, based on JIC Standards; servomechanisms and servo valves.

The book is well illustrated (350 photos and drawings) and has many worked out, fully detailed examples. —*JJD.*

•

FERROUS METALLURGY LABORATORY MANUAL. *By Joseph S Umowski, director of technical education, New Jersey. Published by the American Technical Society, 848 East 58th St, Chicago 37, Ill. 7 x 10, 83 pages, $2.25*

Anyone who is interested in metallurgy but lacks formal training in this field can learn a lot from this straightforward, well illustrated manual. And anyone who has had metallurgical training will do well to go through it, if only to review laboratory testing techniques and the physical principles which underlie modern heat treatment.

The first third of the book is devoted to physical testing and specimen examination; the remainder to heat treatment of ferrous alloys. Each chapter presents general theory, test procedure, and a guide to report preparation. The glossary includes the most commonly used metallurgical terms.

This manual should prove valuable to instructors and students not only at the vocational and technical high school level, but also at the technical institute level.—*JJD.*

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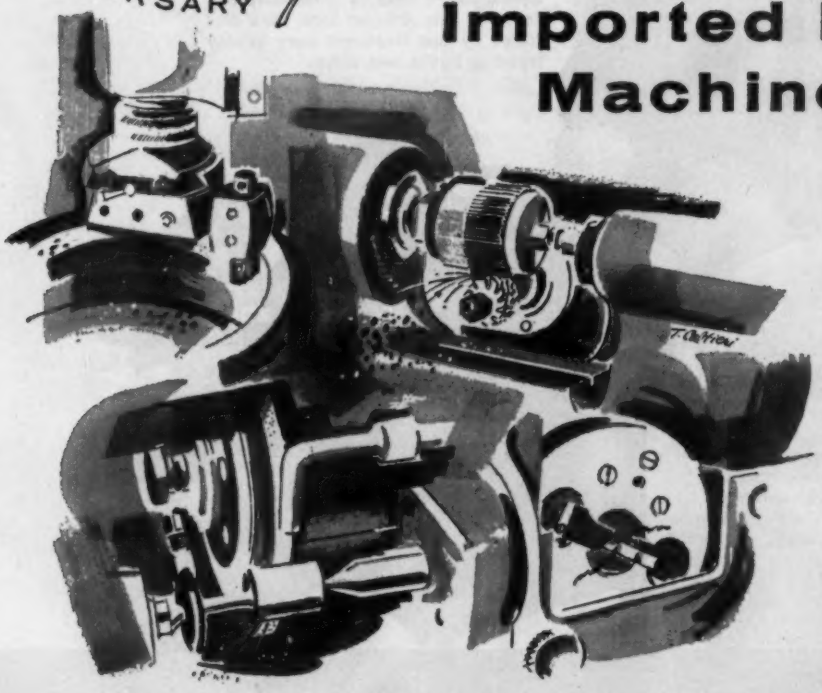

See them in operation—Booths 117 & 653

Coliseum Machinery Show—Sept. 7-15

Cosa will exhibit many of the latest designs in Precision Production Machine Tools. Featured in Booth 653, you will see a new **Deckel LK** with interchangeable heads for Jig Boring and Jig Grinding. There will be a new Coil-fed **Escomatic D-4** form-turning machine, automatically producing small precision parts—centered and drilled to reduce secondary operations. A **Schenck R06** Balancer, with autocycling, will precisely balance small parts revolving at 10,000 to 30,000 rpm. Two **Studer** Universal and Cylindrical Grinders, models RHU 450 and RM 250L, will grind parts to extremely close tolerances. Both Studers can be equipped with O.D. grinding and match grinding measuring devices for automatic sizing, spark-out control and machine shut-off. The RM 250L, a one-lever controlled grinder, is being shown for the first time in this country. A **Koepfer** Gear Hobber 170 for automatic production of various types of gears will also be demonstrated.

In Booth 117, two **Trumpf** Universal Sheet Metal Working Machines will demonstrate copy-nibbling, many curve cutting and forming operations.

Expert technicians will demonstrate these machines and provide information on the entire Cosa line, listed at the right.

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  - Thread
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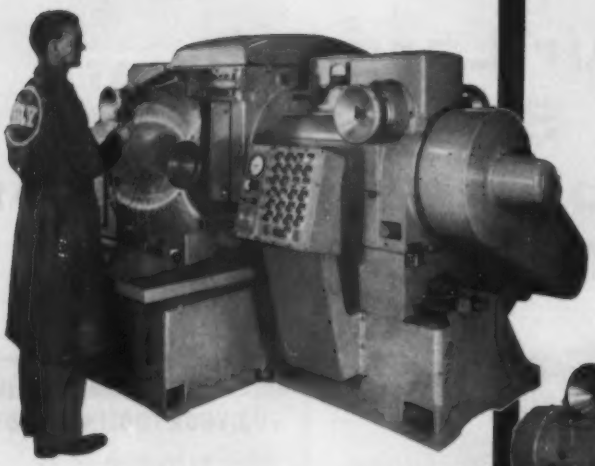

The **Besly DH4** Double Horizontal Spindle Disc Grinder squaring and finishing hardened, high-speed steel tool bits at 600-per-hour rate. Size and parallelism were held to ± .001". Stock removed was .012 per side. Bits distorted by heat treatment were quickly trued up by the twin discs.

Besly DH2 Double Horizontal Spindle Disc Grinder. A smaller version, ideally suited for grinding carbides and ceramics as well as other materials. It features automatic sizing, loading and unloading; excellent for thru feed grinding along with operations requiring clamping of parts such as wrist pins, valve stems, etc., to square grinding surfaces to a mating surface.

for maximum accuracy and productivity...

Besly TV3 Tandem Vertical Spindle Disc Grinder. This new machine has two pair of heads, one with roughing discs for heavy stock removal, the other for grinding to required finish and tolerance. The feed wheel, mounted on the rotary unit is arranged to oscillate and produce "orbital grinding action" for more efficient grinding, extended disc life and less frequent abrasive dressing. Although the TV3 has many applications, it is of greatest interest to spring manufacturers for grinding spring ends square and finishing to size and flatness. The machine can be purchased with only one pair of heads, and a second pair can be added to double the capacity.

"Precision performance with savings in time and labor" aptly describes the benefits you will realize with a BESLY Double Horizontal Spindle Disc Grinder. Long recognized as superior in the industry, the Besly DH4 Grinder has many features that recommend its application to exacting grinding problems. Exclusive precision quill and clutch infeed provides feed increments calibrated in millionths. Discs can be changed in 30 minutes without disturbing setup, cutting downtime in half. Dressing time is only four minutes, a fifth the usual time! Simplified push-button operation and controls, built-in dials, gages, meters to indicate abrasive conditions, motor load, etc., assure precise results, dependable grinding production.

BE SURE TO SEE THESE BESLY HIGH-PRECISION GRINDERS AT THE MACHINE TOOL EXPOSITION . . . SPACE NO. 251

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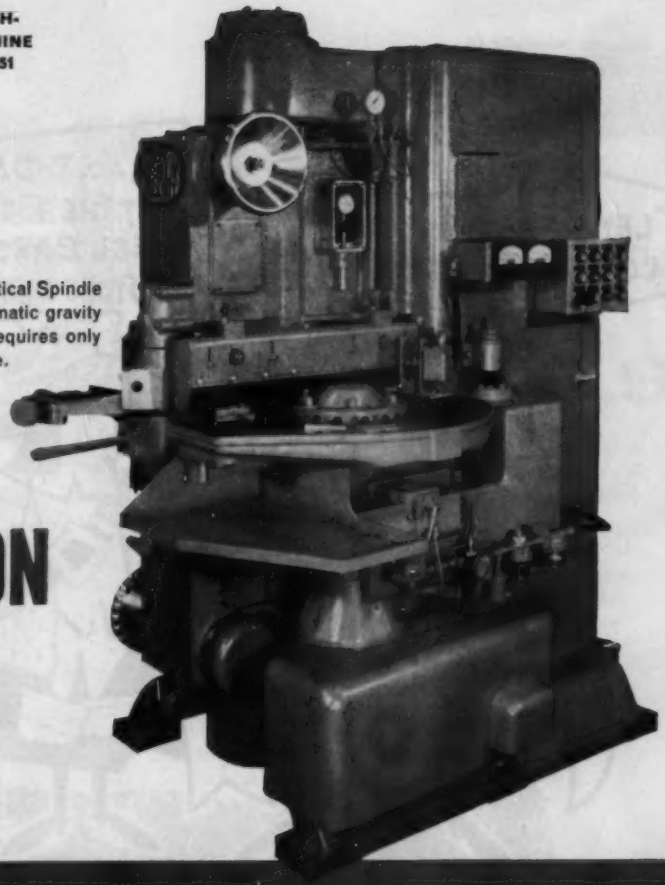

Besly DV2 Double Vertical Spindle Disc Grinder with automatic gravity feed and discharge. Requires only 8-ft. by 8-ft. floor space.

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The DV2 will grind parts that range from .050" to $2\frac{1}{2}$" in thickness and .375" to 3" in diameter. In addition to grinding carbides or hard ceramics that require diamond abrasives, the DV2 also grinds stampings, plastic parts, alnico magnets, bearing races, coil springs, carbon parts and the like with resinoid-bond abrasive discs.

WRITE FOR THIS NEW illustrated catalog describing Besly Disc Grinders.

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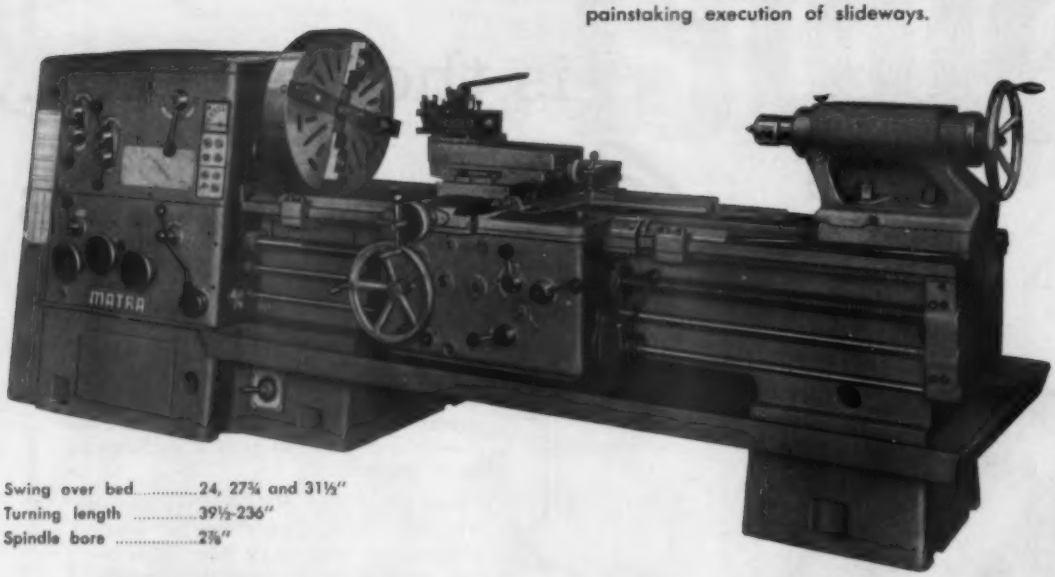

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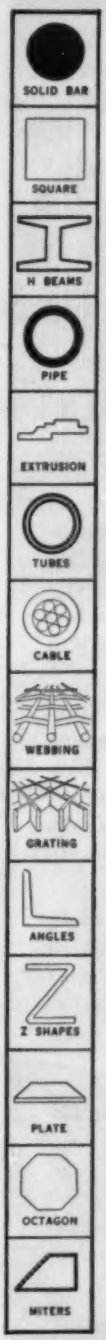

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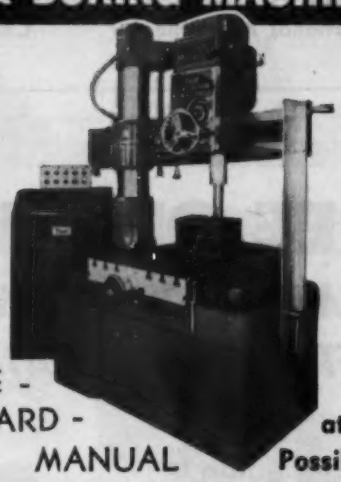

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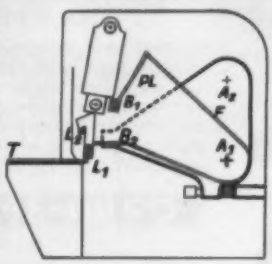
Bevel Shearing in 1 operation

with Corpet-Louvet hydraulic guillotines

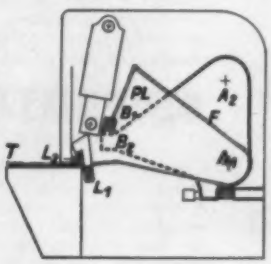
Two Blades are mounted on the blade holder PL. L^1 is for straight cut, L^2 for bevel cut.

During the straight shearing operation PL rotates around the ball and socket joint A^1 of end-bearing plate F.

L^1 shears straight into Sheet T.



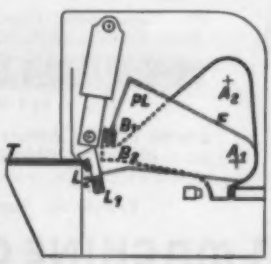
At the end of the straight shearing, thrust B^1 mounted on the blade holder PL meets thrust B^2 mounted on end-bearing plate F.



Blade holder PL and end-bearing plate F have become solid, rotate around joint A^2 of the frame.

L^2 then bevel shears.

There is no waste of time between two shearings.



SHEARS ALL SHEET-METAL...
FROM THE THINNEST TO THE THICKEST

1 time saving

No more time lost in handling. Straight shearing and beveling are done in immediate sequence. No need to change position of the sheet or to adjust the machine.

2 simplified maintenance

Table height adjustments have been eliminated: the table is stationary. Blade holder adjustable guides also eliminated. Change of position is made by mere contact of two thrusts.

3 easy blade adjustment

Two thrust screws control the clearance adjustment between the stationary blade and the straight shearing blade. Two additional screws control the clearance adjustment between stationary blade and bevel shearing blade. Perfectly straight cuts are obtained for sheets of the following gauges: 19/32", 51/64" or 1".

As required, you can shear straight, with full bevel or with partial bevel.

FROM FRANCE: Booth 122
COLISEUM MACHINERY SHOW

CORPET-LOUVET & Co

6, rue Gambetta, LA COURNEUVE (Seine) FRANCE

Talking Shop...

Definition

A BORE is a fellow who talks when you wish he would listen.

Shadow Show

WHEN PAST Machine Tool Expositions are mentioned, you never hear of the one in 1939. That is the "Show that wasn't." After the successful 1935 Show, it was decided to hold one in Convention Hall in Cleveland in September, 1939. It was a wild, gay summer and fairgoers in New York were trekking to see the "World of Tomorrow" while across the country machines were being shipped off to Cleveland for the Show. But two dictators at the extreme left and extreme right politically—and most readers know we mean Stalin and Hitler—signed a non-aggression pact. War clouds gathered and "defense" plants began calling for machine tools. The trains were diverted and Uncle Sam stepped in and cancelled the Show.

And it was eight years and a World War before America could hold another machine tool show.

Why September?

WEATHER ISN'T ALWAYS the best in Chicago in early September, and the atmosphere in a show sometimes seems to rival the heat-treating department in mid-summer. The problem is that it takes months to set up a show like the one in the amphitheatre. And summer is the only time that large exhibit halls are normally idle and it is practical to take one over for the long setup period.

That's why we have a tradition in this country of holding the shows in the first two weeks in September.

Five Years Later

AS YOU APPROACH this year's show at the Amphitheatre, with about 75 numerically controlled machines on display and another 10 or 12 on the Navy Pier, you might pause to recall the debut of such machines at the 1955 show.

At that time Jones & Lamson displayed a numerically controlled turret lathe and Giddings & Lewis had pictures and data on their skin mills with numerical control. Four machine tool builders caught the public eye with positioning tables: Arter, Bullard, Fosdick, and Wiedemann. At the Navy Pier, there were three more positioning tables: Farrand, Hillyer, and General Electric.

That was the beginning. Take a look at the list on page 191 to see how many there are this year.

Wheel Truing

LOCOMOTIVE WHEELS are dressed by the New York Central without removing them from the locomotive. The wheel truing machine is installed in a pit at the DeWitt Diesel Terminal at E Syracuse. The cutting tools are Sandvik Coromat carbide inserts which contour flange and rim without removing the trucks from the locomotive.

Cereal Test

THE AIRCRAFT and missile people do manage some rather unique test procedures. A while back we told you about the "ultra-low frequency sound test" performed on missiles by tapping them with the handle of a screwdriver.

Now we learn that at Convair, the test engineers spread 21 boxes of breakfast cereal (Kellogg's Corn Flakes, if you must know) in front of an engine test stand. Object was to see if the engine would suck up small objects from the ground. The engine gulped one normal serving of cereal from the 378 servings available, but no damage was recorded.

Next step will be talc—to study air flow — then will come assorted foreign objects to see just what special protection (if any) the air intakes on the J-79-5 jet engines used in the B58 will need.

Men Who Matter

ABOUT THIS TIME, billboards in certain areas of Chicago are sprouting a message that will be understood by all the readers of this magazine. They say simply: "In metalworking Men Who Matter read American Machinist/Metalworking Manufacturing." The reason for the billboards —in locations around the Amphitheatre, the Navy Pier, the Coliseum, the airports, and the connecting routes—should be obvious to all Men Who Matter.

Most of the 125,000 MWM that stream in to Chicago next month are already subscribers to AM/MM or else they are pass-along readers. We suspect some of them aren't and that's the reason for the billboards. There are only two ways to see this magazine: subscribe to it or read the copy of someone who does. (This issue is a rare exception—each booth at all three shows will get a free reference copy for use during the shows.) So when you spot one of our billboards in Chicago next month you'll know why it's there. But we'll bet a few million nonmetalworking residents of the Windy City are going to be bewildered.

FIELD REPORT...

MPB Acquires Carter Engineering

Miniature Precision Bearings Inc, Keene, NH, has taken over the Carter Engineering Co, Ferrysburg, Mich, manufacturer of Alinabal series of rod-ends, spherical bearings, and ball linkage devices. Acquisition will enable MPB to expand the product line of its Split Ballbearing Division. Carter firm, including its manufacturing operations, will be transferred to the SBB plant in Lebanon, NH, later this year.

Argentine Company to Purchase US Machine Tools

Industrias Kaiser Argentina (IKA), Buenos Aires, an affiliate of Willys Motors of Toledo, has received a $1 million credit from the Export-Import Bank of Washington. Proceeds of the credit will be used to purchase US machine tools for IKA's automotive manufacturing plant at Cordoba, Argentina. An $11 million expansion program now underway is aimed at increasing automotive production from 38,000 to 60,000 units per year. Loan is repayable over five years.

Brush Beryllium Opens West Coast Plant

Brush Beryllium Co of Cleveland has opened its first fabrication plant on the West Coast. Facility, located in Hayward, Calif, will supply machined beryllium components to the aerospace and nuclear industries. In addition to provision of increased space for fabrication in Cleveland, Brush has expanded its research and development facilities, and is currently increasing production capacity of its fully integrated beryllium facilities at Elmore, Ohio. It's also in the process of moving its alloy precision rolling mill in Reading, Pa, to larger quarters in nearby Shoemakersville.

Alloy cast steel gear, reportedly the world's largest generated single helical split ring gear, has a diameter of 23 ft, a 30-in. face width, and finish weight of approximately 85,000 lb. Four of them are being manufactured by Farrel-Birmingham for Allis Chalmers and will be installed in a southeastern cement producing plant. Gears are cut on a large Farrel 12C gear generator. This is the largest gear produced so far at the Buffalo plant; present manufacturing facilities, however, will handle gears with diameters of from one inch to 27 feet

Food Machinery & Chemical Corp...

. . . San Jose, Calif, has rescinded its offer to acquire Saco-Lowell Shops of Boston through exchange of stock. FMC President Paul Davies made the announcement after Maremount Automotive Products, Chicago, stated that it had a 34% interest in Saco-Lowell, and offered to purchase—at $25 a share—sufficient additional shares to give it a majority interest. FMC had originally hoped to acquire Saco-Lowell with a view toward the manufacture and development of textile machinery.

Twin Coach Forms New Division

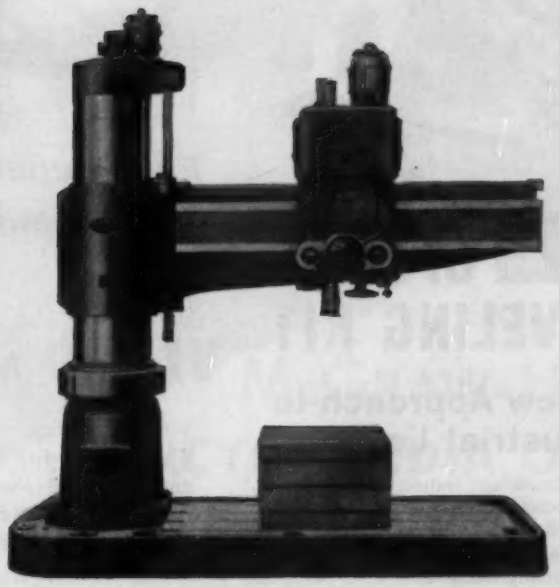
Twin Coach Co, producer of aircraft, missile, and vehicle parts, is setting up a new manufacturing operation in New York state outside the western New York area for non-aircraft production work. It has formed a new Special Products Division to operate the 48,000 sq-ft plant it is leasing in Waverly, southeast of Elmira, for work on non-aircraft contracts.

Company recently said it cannot profitably engage in non-aircraft work in its Cheektowaga plant because the so-called aircraft labor rates that prevail in the plant are too high. Claim was disputed by the AFL-CIO International Association of Machinists which rejected the company's request for an unskilled wage classification for non-aircraft work in the Cheektowaga plant.

New division will produce trailers, initially. Company recently received a $2.4 million Army Ordnance contract to turn out 3560 chassis and 400 bodies for the Army's M-101, a two-wheel, all-purpose trailer.

McGIRK'S WORKS by GEO. CRENSHAW

HEY, GENIUS!... WE'RE RUNNING BEHIND SCHEDULE. DROP THAT BROOM AND SPEND THE REST OF THE AFTERNOON BATTING OUT BALL BEARINGS!
OKAY, MR. SCRUGGS!
WHACK!
BALL BEARINGS
McGIRK'S WORKS
MOE'S CORNER
I'll catch that stupid idiot if it's the last thing I do!



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OPTICS and METROLOGY

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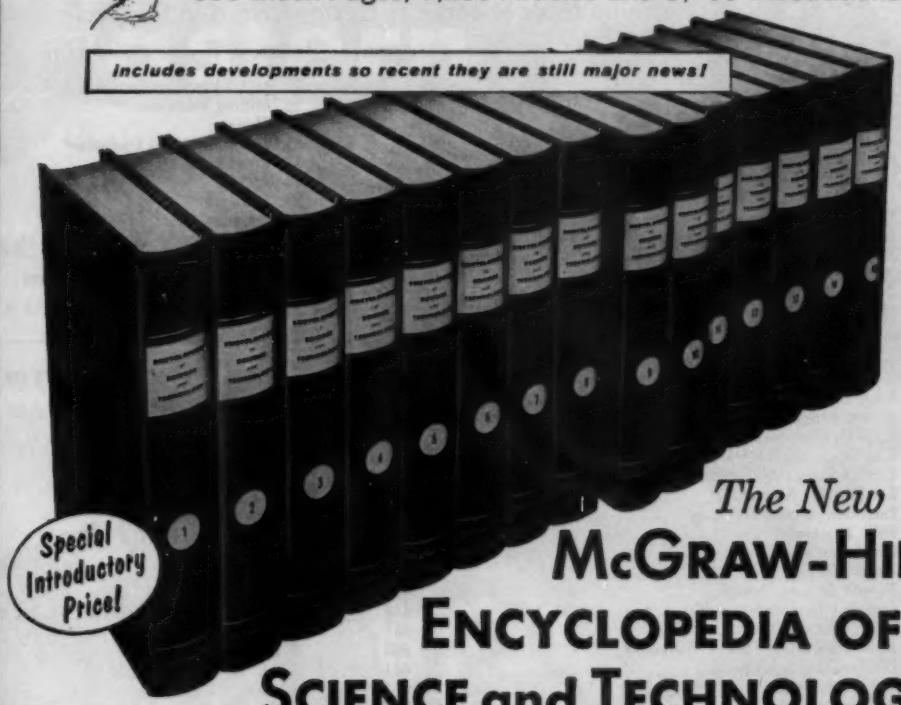

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2. Automatics
4. Bending Machines
5. Bolt Machines
6. Boring Mills
14. Die Casting Machinery
16. Drilling & Reaming Machines
19. Fabricating Equipment
21. Forging Equipment
24. Gear Cutting Machines
25. Grinding Machines
30. Lathes
31. Liquidating & Appraising Plants
32. Machine Tools
35. Metal Working Equipment, General
36. Milling Machines
40. Planers
41. Plastic Molding Equipment
43. Press Brakes
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63. Welding Equipment

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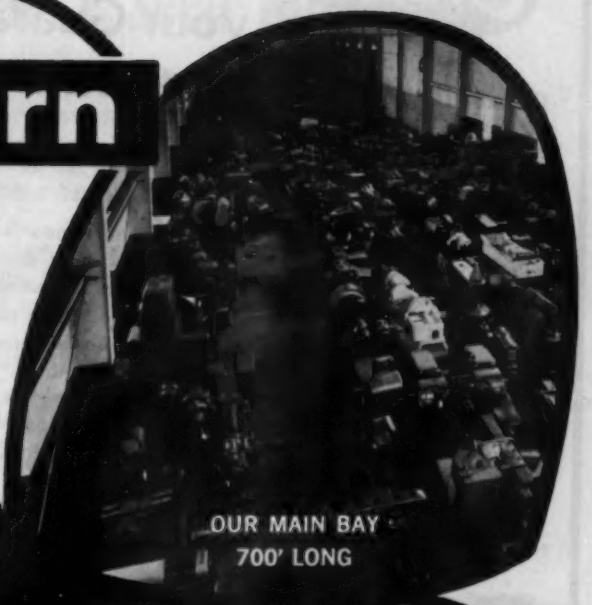

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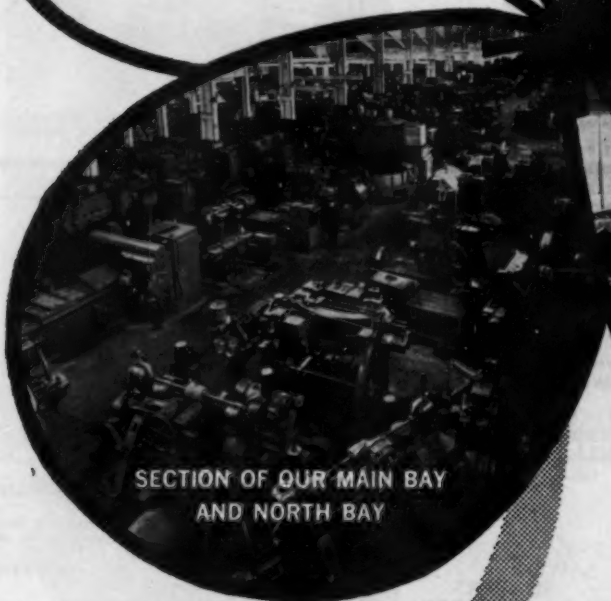

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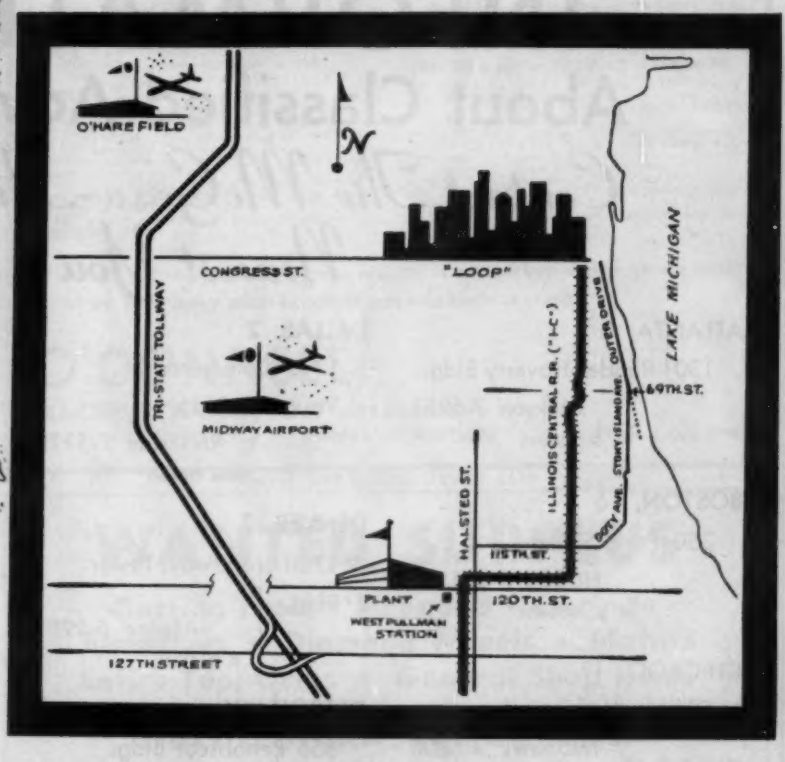

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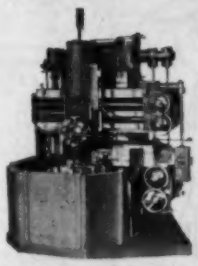

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25" FOSDICK Upright, round column, 1941

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24"x72" cc SIDNEY, Timken spindle, 1935
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42"x17' centers AMERICAN Super Productive, 2 carriages, 1942
48"x9' cc AMERICAN Super Productive, 1943 like new
48"x20' cc BETTS BRIDGEFORD, 1942
48"x30' cc NILES, 2 carriages, taper attachment, 1942
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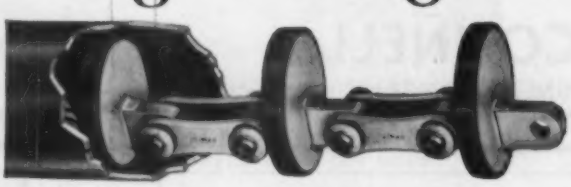

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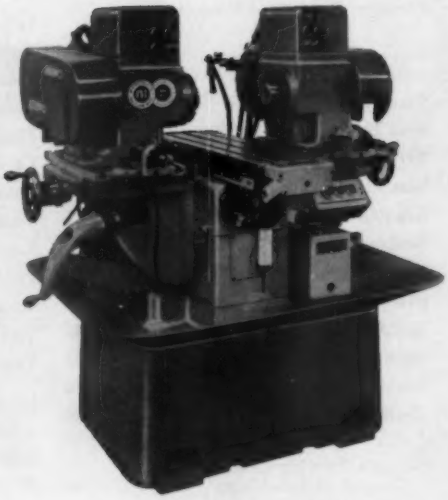

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